Maternal and fetal mortality and morbidity in hospitals in Kano State and Kaduna State, Nigeria

Considerations of Prevention and Management

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STEFANIE ADAMS

aus Krefeld

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aus dem Zentrum für Frauenheilkunde und Geburtshilfe
Universitätsklinikum Gießen und Marburg GmbH
Standort Gießen
Leiter des Instituts: Prof. Dr. Dr. h.c. H.-R. Tinneberg

Gutachter: Prof. Dr. W. Künzel

Gutachter: PD Dr. M. Knipper

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ABBREVIATIONS

ABUTH	Ahmadu Bello University Teaching Hospital
AIDS	acquired immunodeficiency syndrome
AKTH	Aminu Kano Teaching Hospital
ANC	antenatal care
B	balloon
BEOC	basis essential obstetric care services
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung
BP	blood pressure
BW	bladder wall
CEOC	comprehensive essential obstetric care services
CHEW	community health worker
CS	Caesarean section
CWIQ	Core Welfare Indicators Questionnaire Survey
D/C	dilatation/curettage
DMA	Drugs Management Agency
EOC	essential obstetric care
EUO	external urethra opening
EUO/B	distance between external urethra opening and balloon
EUO/BW	distance between external urethra opening and bladder wall
FCT	Federal Capital Territory
FMOH	Federal Ministry of Health
FMR	fetal mortality ratio
GP	general practitioner
HIV	human immunodeficiency virus
HMB	Hospital Management Board
HR	heart rate
IAMANEH	International Association for Maternal and Neonatal Health
IQA	Institute of Quality Assurance

LGA	Local Government Area
LSS	live saving skills
MD	Maternal death
MDG	Millennium Development Goals
MMR	maternal mortality ratio
MOH	Ministry of Health
MVA	manual vacuum aspiration
NPC	National Population Commission
OB/GYN	Obstetrics/Gynecology
PHC	primary health care center
PMC	Population Media Center
PPH	postpartum hemorrhage
RC	Rotary Club
RDG	Rotary Deutschland Gemeindienst e.V.
RFPD	Rotary Action Group for Population and Sustainable Development
RI	Rotary International
RVF	recto-vaginal fistula
SHC	secondary health care center
TBA	traditional birth attendant
THC	tertiary health care center
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations International Children's Emergency Fund
VVF	vesico-vaginal fistula
WHO	World Health Organization

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1. Aim of investigation and introduction

1.1. Maternal and fetal mortality and morbidity in Nigeria

Maternal and child mortality in Africa, especially in Nigeria, is one of the highest in the world. *Maternal death* is defined as a *"death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes"* [14]. Maternal death is usually measured by the maternal mortality ratio (MMR), e.g. the number of maternal deaths per 100,000 live births.

According to the World Health Statistic of the WHO [1], an average of 900 maternal deaths (MD) per 100,000 live births occurs in Africa. Nigeria´s maternal mortality ratio is higher than the mean MMR in Africa: 1100 MD/100,000 live births. The under-five mortality, the probability of dying by age of five, averages 142/1,000 live births in Africa, in Nigeria 186 children per 1,000 live births die by the age of five. Nigeria has one of the worst records of maternal and child deaths in the world until present time.

Half of the maternal deaths worldwide occur in African Region and another third in south-east Asia Region. High maternal and fetal mortality rates are indicators for inadequate maternal health care in the country and Nigeria is still one of the countries with the highest maternal and fetal mortality worldwide.

For reasons of lacking civil registration systems maternal mortality is difficult to measure. Estimations of national health programs have limited access to exact data of maternal mortality [2]. Maternal deaths might be under-reported, especially in developing countries, for reasons of lacking registration of maternal deaths [3]. There is an urgent need for better country level data and for support to building information systems able to identify and monitor all births and deaths [15].

Two of the eight existing Millennium Development Goals (MDG) are aimed to decrease children and maternal mortality, which illustrates the importance of these targets for world population. All 192 United Nation Members and world´s leading development institutions agreed in 2000 to achieve the Millennium Development Goals by the year 2015. MDG 4 encompasses the reduction of the under-five mortality rate by two thirds between 1990 and 2015. MDG 5 target pursues reduction of maternal mortality ratio by three quarters by 2015 and achieve universal access to reproductive health. Those targets include eradicating extreme

poverty and hunger, achieving universal primary education, promoting gender equality, fighting disease epidemics such as HIV/AIDS and Malaria, ensuring environmental sustainability and developing a global partnership for development [16].

In Nigeria, reaching the Millennium Development Goals is still a big challenge. Sustainable success could not be reached at the moment, neither through Federal Government, nor through development institutions, which make efforts in decreasing maternal and fetal mortality. *Hogan et al.* registered in a study, measuring maternal mortality in 181 countries, a global annual average rate of decline over the period 1990-2008 of 1.3%. Nigeria was estimated to register increased maternal mortality from a mean of 516 MD/100,000 in 1980 up to 608 MD/100,000 in 2008 [4]. The National Population Commission (NPC) reported a childhood mortality of 75 children per 1,000 live births and a maternal mortality of 545 per 100,000 live births in Demographic and Health Survey from 2008 [5]. Maternal health remains the target for which progress has been most disappointing [15].

Causes of maternal mortality

The causes of maternal morbidity and mortality can be divided into direct and indirect causes. Direct obstetrical complications include hemorrhages, infections, unsafe abortion, eclampsia and obstructed labor. Indirect causes for maternal deaths are diseases, infections (i.e. malaria, HIV/AIDS, hepatitis) and anemia related to poor nutrition [6, 7 and 8]. Eclampsia, a complication of pregnancy, remained the leading cause for maternal and perinatal mortality and morbidity in Nigeria. *Kullima et al.* [9] registered in a study a percentage of 46.4 deaths from eclampsia. Maternal deaths remain higher among those patients, who experienced antepartum eclampsia compared to those who had intrapartum or postpartum eclampsia. Magnesium sulphate is provided by Nigerians government for reducing eclampsia and maternal deaths caused for eclamptic reasons. WHO [17] recommended magnesium sulfate as an effective inexpensive and safe intervention to treat women with eclampsia and pre-eclampsia. It is estimated, that a 50% increase in the use of magnesium sulfate would prevent 10-15 maternal deaths per 100,000 live births in low resource countries.

Other studies in Nigeria by *Abe and Omo-Aghoja* [10] mentioned four leading direct causes of maternal mortality: Sepsis (27.4%), hemorrhage (24.4%), obstructed labor (16.3%) and eclampsia/pre-eclampsia (15.6%). The two leading indirect causes for maternal mortality were institutional difficulties e.g. lack of power supply, lack of blood, delayed referral, delayed decision making and inability to pay fees in 16.8% and anemia in 8.2%.

Besides the known reasons of maternal deaths, also the booking status of the women before delivery influences the maternal mortality. *Umeoro and Ejikeme* [11] represented higher mortality, which was statistically significant ($p < 0.0001$), in those patients, who were unbooked before delivery. The MMR of the booked women was 676MD/100,000 deliveries, the MMR of unbooked patient´s 4,617/100,000 deliveries. Also a lower social status and a lower number of parity as well as a young age were correlated with a high maternal mortality.

Antenatal care

The WHO reports of antenatal care coverage in 2010, with at least one visit for antenatal care during pregnancy, with an average of 73% in Africa. Nigeria had antenatal care coverage only of 58% in 2010 [1]. In comparison in Germany guiding principles for prenatal care exist, which intend at least ten antenatal visits and three antenatal care visits with ultrasound diagnostic between 9.-12, 19.-22. and 29.-32. weeks of pregnancy [18]. In developing countries antenatal care is important for reasons of high rates of malaria, HIV-infections, tetanus or anemia in poorly nourished women [6]. *Garenne et al.* [7] mentioned the lack of antenatal care as a risk factor of maternal mortality.

Reduction of maternal mortality by Quality assurance in obstetrics – a major sustainable goal

Although many studies register different causes of maternal deaths, the main reasons for maternal deaths are well known. Despite all efforts by government and development institutions, a sustainable decrease of maternal and fetal mortality could not be achieved to the present time.

For reaching a reliable data evaluation and starting a well-directed development aid for single hospitals in northern Nigeria, an Institute of Quality Assurance (IQA) was supposed to be founded in January 2008, located at the Aminu Kano Teaching Hospital (AKTH). Ten hospitals, five in Kano State and five in Kaduna State, participate in a regular monthly data collection for evaluating obstetrical data, including maternal and fetal mortality and indicators of maternal and child mortality and morbidity.

In these hospitals data are monthly collected by a chief midwife for a half-yearly statistics analysis of the data of the ten hospitals. Relations between maternal and fetal mortality and various indicators have been evaluated and the data have been regularly presented and discussed in half-yearly meetings with doctors and midwives from the hospitals.

Additionally, regular monitoring visits of all ten hospitals take place. An evaluation of the hospital status, including equipment and hygienic status and number of doctors and nurses working in the hospitals was conducted in December 2009. Existing lack in equipment and hygiene as well as lack of employees for conducting a sufficient maternal health care could be shown.

Education programs for doctors and nurses are conducted at the half-yearly “review meetings” e.g. use of anti-shock garments and the use of fetal Doppler.

1.2. Northern Nigeria - General information, population and health care

1.2.1. General information

The Federal Republic of Nigeria is located between the Tropic of Cancer and the Tropic of Capricorn, on the Gulf of Guinea on the western coast of tropical Africa [12]. It is part of West Africa and borders the countries Benin in the west, Niger and Chad in the north and north-east and Cameroon in the east. With an area of 923,769 km² and a population of 140,431,790 inhabitants, the Federal Republic of Nigeria is the most populous country in Africa [13]. The Federal Republic of Nigeria is divided into 36 States and the Federal Capital Territory (FCT), Abuja. The population density of Nigeria is 152/km² [13], comparatively in Germany there is a population density of 230/km² [19].

The national language of Nigeria is English. Other languages spoken are Yoruba in the southwest, Hausa in the north and Igbo in the southeast regions of the county. Two religions are mainly represented in Nigeria, the Muslims mainly in the north and the Christians mainly in the south of the county, but also natural religions are represented all over the county [20]. About 250 social-linguistic groups exist in the Federal Republic of Nigeria [13].

Since 1999 the Federal Republic of Nigeria is a presidential democracy. The current President and Commander-In-Chief of the Armed Forces of the Federal Republic of Nigeria is Dr. Goodluck Jonathan (since 06.5.2010), Vice-President since May 2010 is Namadi Sambo. Foreign secretary of the Federal Republic of Nigeria is Henry Odein Ajumogobia [20].

1.2.2. Education

The educational system in Nigeria is divided into six years of primary school, three years of junior secondary, three years of senior secondary and four years of university or undergraduate education leading to the award of a degree. The junior secondary school is both, pre-vocational and academic. At the senior secondary level, technical, commercial and other vocational courses are included [13]. A total number of 54,434 schools exist in Nigeria (data year 2008). In 2008 a total enrolment of 21,294,518 students were registered; 11,483,943 of them male pupils and 9,810,575 female pupils. The Teacher/Pupil Ratio in the schools was 36. The completion rate in 2006 was 12.1% for primary school and 20.1% for secondary school. The English literacy was 54.5% in 2006 [13].

1.2.3. Employment

The total employment by economic activities, measured in 2007, registered a total working population of 54,030,000 people in Nigeria. Most of them (31,277,967) working in the sector of agricultural, hunting, forestry and fishing; many in the educational sector (10,443,999), public administration, defense and community social services (5,338,164) and transport, storage and communication sectors (1,107,615) [13].

1.2.4. Household statistics

Household statistics by using the Core Welfare Questionnaire Survey (CWIQ) is designed to collect household data for quantitatively profiling the Welfare of Nigeria´s population. It represents the spread and trends of poverty level in Nigeria, which includes the lack of income, lack of access to health, education and other services as well as powerlessness, isolation, vulnerability and social exclusion. In Nigeria 63.9% of the people do classify their own household as poor, 67.0% in rural areas, 57.9% in urban areas [13].

Electricity, water supply and sanitary facilities are some welfare indicators registered in the statistics in 2008.

The percentage distribution of households by type of electricity facilities demonstrates, that 41.3% had a public access only, 7.4% a public and private access and only 3.2% a private type of electricity, 48.0% had other forms or no electricity. In total 55.2 percent of the households in Nigeria have electricity access [13].

The dwelling units by type of water supply had a household distribution in 2008 of 8.8% pipe-borne water, 28.4% bore-hole water, 31.5% well water, 27.6% streams or ponds and 3.2% of tanker, truck and vans. In total 85.2% of the population of Nigeria have any access to water, a year-round water source is guaranteed in only 43.3% [13].

Most households in Nigeria are only supplied with a pit (54.6%) as a toilet facility, 0.1% using pails, 15.3 water closets and 30.1% other type of toilets [13].

1.2.5. Health care system in Nigeria

The health delivery services in Nigeria are provided by the Federal Government; State Governments, Missionaries, Corporate Organizations, Private Agencies and Individuals [13]. The Federal Ministry of Health (FMOH) in Nigeria has eight departments specializing in different aspects of health care [21]:

- Family Health
- Finance and Accounts
- Food and Drug Services
- Human Resources
- Hospital Services
- Planning Research and Statistics
- Procurement
- Public Health

Minister of Health of the Federal Republic of Nigeria is currently (2010) Prof. C.O. Onyebuchi Chukwu.

The functions of the department of Family Health are to develop, coordinate and implement policies and strategies and provide Nigerians population with improved and sustained quality health services, including improved nutritional status to reduce maternal mortality and infant mortality rates and increase the life expectancy of Nigerians. Awareness on nutrition, Reproductive, Maternal, Neonatal and Child Health, Adolescent Health Development and School Health are areas of responsibility of the Department of Family Health. To improve and promote quality services in Nigeria, a collaboration with all Departments within the Federal Ministry of Health, the ministries and development partners and other relevant stakeholders are necessary [22].

The department of Hospital Services supervises 23,636 health care facilities all over Nigeria, 14,607 public health care facilities and 9,029 private health care facilities [13].

The *Ministry of Health of Kano State* is responsible for 666 public health care facilities [637 primary health care centers (PHC), 27 secondary health care centers (SHC) and two tertiary health care centers (THC)] and 15 private health care centers (all of them secondary hospitals) [13].

In *Kaduna State the Ministry of Health* supervises 827 public health care centers (813 PHC, 11 SHC and three THC) and 333 private health care centers (331 PHC and two SHC) [13].

The access to health care centers is limited for Nigerians population, especially for the people living in urban region. In 2006 a total of 55.1% had access to medical service, 70.9% in the urban region and only 47.8% of the population of rural regions had access to medical services [13].

Figure 1: *Primary health care centre in Kuyello village in Kaduna State*

1.3. Northern Nigeria – Structure of the health care system

1.3.1. Ministry of Health in Kano State and the health care system

Kano State, located in north-west of Nigeria, is one of the 36 states in Nigeria and borders Katsina State to the north-west, Jigawa State to the north-east, and Bauchi and Kaduna States to the south. The Governor of Kano State, at the time of this report, was Malam Ibrahim Shekarau. The state of 20,280 km² is divided into 44 Local Government Areas and has a population of 9,401,288 (census 2006) [13, 23], which is a population density of 464/km². The majority of the people living in Kano speak the Hausa language but the official language in Kano State is English.

"The Ministry of Health (MOH) is one of the 16 existing ministries in Kano State. It is the coordinating and controlling authority for agencies and institutions in the health sector that are owned by the State Government. It is responsible for the overall supervision of the implementation process of the National Health Policy as well as state policies and measures on health matters, and has oversight over health facilities owned by other organizations within the state.

The internal structure of the ministry is made up of five Directorates, each headed by a ranking Director. These are:

- Directorate of Primary Health and Disease Control,
- Directorate of Medical and Health Care Services,
- Directorate of Administration and General Services,
- Directorate of Nursing Services; and
- Directorate of Planning, Research and Statistics

Each of these departments is sub-divided into specialized departments and units.

In addition to the main ministry two semi-autonomous Parastatals exist, the Hospital Management Board (HMB) and the Drugs Management Agency (DMA).

The Hospital Management Board is responsible for the recruitment, training, remuneration, promotion and discipline of the staff of all State government-owned hospitals and health centers, the coordination and supervision of the activities of all zonal Hospital Management committees in the State as well as the purchase, the renovation and rehabilitation of the hospital equipment and the structure of the hospitals.

The Hospitals Management Board has a board and Directors consisting of members and an Executive Secretary who is the Chief Executive officer of the organization. It has two directorates headed by a Director each, who report to the Executive Secretary, namely:

- Administration and General Services.
- Hospitals Services

The structure also includes the professional departments of Medicine, public Health and Nursing, each headed by a head of department which reports directly to the Executive Secretary.

The Drugs Management Agency was established for the purpose of procurement, production and supply of high quality drugs to Government hospitals at affordable prices. It is supposed to provide adequate and continuous supplies of essential drugs on a revolving fund basis. A General Manager, who reports to the Commissioner of Health, heads the agency." [24]

Figure 2: *Pharmacy of primary health care center in Kuyello village, Kaduna State*

("-" page 10 line 9 to page 11 line 12 is an official statement of the Kano State Government according to the official announcement (www.kanostate.net/health2.html) [24].

1.3.2. Ministry of Health in Kaduna State and the health care system

Kaduna State and its capital Kaduna are located in central northern region of Nigeria. It shares common borders with Zamfara, Katsina, Niger, Kano, Bauchi and Plateau States. To the South-West, the State shares a border with the Federal Capital Territory, Abuja. The Governor of Kaduna State, at the time of this report, was Arch Mohammed Namadi Sambo. The State is divided into 23 Local Government Areas and has a population of 6,113,503 (census 2006) at a size of 42,481 km² [13, 25], which is a population density of 144/km².

Kaduna State is mostly populated by Hausa, Gwari, Katab and Bajjuu ethnic communities, along with up to 36 other indigenous ethnic groups found in different parts of the State. The main ethnic groups are: Hausa, Fulani, Bajju, Kataf, Kagoro, Moro'a Jaba, Gbaggyi, Kanninkon, Ninzam, Chawai, Atyap, Ham Kurama and others, with Hausa and English languages as common languages [25].

"The Ministry of Health is one of the 24 existing ministries in Kaduna State. It was created to essentially provide responsive and basic healthcare service to all citizens in the state.

Apart from a large University Teaching Hospital in Zaria, there are large and fully equipped government hospitals located in Zonkwa, Jama'a and Kafanchan. Smaller government and privately owned ones are also found in towns like Birnin Gwari, Kagoro, Saminaka and Soba. The State Government, together with the Federal Government and the World Health Organization (WHO), has also established Comprehensive Primary Health Care Units in some selected rural areas; (e.g. Yaka Wada in Giwa LGA) which provide child care, pre- and ante-natal health care." [26]

("-" line 13 to 21 is an official statement of the Kaduna State Government according to the official announcement (www.kadunastate.gov.ng/health.htm) [26].

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2. The “three delays” as causes of high maternal mortality

2.1 First delay: Socio-economic factors as causes for maternal and fetal mortality in the villages

2.1.1. Community dialogues in the villages
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2. The “three delays” as causes of maternal mortality

According to estimates made for the year 2005 by WHO, UNICEF, UNFPA and the World Bank [16] a total of 536,000 maternal deaths due to complications associated with pregnancy and childbirths occur worldwide. Developing countries accounted for 99% (533,000) of these deaths. More than half of maternal deaths (270,000) occurred in sub-Saharan Africa region in 2005.

Most of the maternal deaths result from direct obstetric causes such as hemorrhages, infections, unsafe abortion, eclampsia and obstructed labor. A majority of these deaths could have been prevented by timely medical treatment [1].

The international literature focuses the awareness on three delays, which mainly explain the high maternal mortality. The *first delay* takes place in the villages; it is a socio-economic factor. The problems are based on insufficient knowledge of the dangerous signs before and during labor, the delayed decisions to bring the patients to a hospital and the insufficient power of decision making. The *second delay* is related to the transport of the patient. The reasons for the late arrival of the pregnant woman to the hospitals, in general related to households with low income, are long distances to the tertiary health care centers and insufficient conditions of the roads. The *third delay* is caused by hospitals with an insufficient system for hospital care. Mostly the hospitals are inadequate equipped and staffed. The personnel in the hospitals are not trained satisfactory and in addition high work load for the employees in the hospitals delays sufficient care.

The “three delays” are closely connected and influence each other; a complex interplay between the delays leads to maternal deaths. Although most of all maternal deaths occur as a result of all three delays, any one of the delay is connected with maternal and fetal deaths [1].

2.1. First delay: Socio-economic factors as causes for maternal and fetal mortality in the villages

The first barrier for reaching health care facilities is the delay in deciding to seek care on the part of the individual, the family, or both. Important factors for decision to seek care are the distance to the next health care facility, financial cost of receiving care and the quality of care. At first the illness factors influence the decision of women to seek care. Recognition of illness is defined by the patient’s view of reality, not by health professional’s medical criteria [1]. The recognition of illness is closely connected with lack of education, lack of health literacy, harmful cultural practices and lack of life skills [2].

Importance of education level and receiving antenatal care was shown in a study by *Harrison* [3]: In populations of women without any formal education and no received antenatal care, that was 33% of the surveyed population, the maternal mortality was 2900 per 100,000 live births. The surveyed population with education and antenatal care combined, only 10%, had a maternal deaths ratio of 250 per 100,000 live births.

In many countries women do not decide on their own to seek care, therefore causes of maternal morbidity and mortality exist at the households, community and district levels. The decision often belongs to a spouse or to senior members of the family. In certain areas women need permission to travel, which usually is be given by the husband [1]. Awareness and perception among the community members of the causes of maternal deaths will influence their decision to seek help e.g. for women with obstructed labor or postpartum hemorrhage [4].

The correlation of individual household and community characteristics and using of maternal and child health services in Nigeria was represented in a study by *Babalola and Fatusi* [5] in 2009: A strong relationship could be found between educational level and presence of medical personnel at delivery. Women without any formal education seek medical personnel at delivery in 17.7%, women with a post-secondary education in 93.4%.

Affiliation to ethnic groups had a close relation to frequency of antenatal care and delivery in health care facilities. Hausa and Fulani women, both ethnic groups of northern Nigeria, seek medical personnel at delivery in 15.2% and 17.6 %, much less in comparison to other ethnic groups, e.g. Yoruba and Igbo delivered with the attendance of medical personal in 81.4% and 78.7% of the cases [5]. Thus woman of Hausa-Fulani ethnic group was at a higher risk of dying during pregnancy and childbirths in north-central Nigeria according to a study by *Ujah et al.* [6] in 2005.

Socio-economic status, with a higher antenatal care and medical personal at delivery in rich households, and type of place of residence are strong predictors of seeking health facilities of women in labor. The study by *Babalola and Fatusi* [5] shows that women in urban regions had the attendance of medical personal in 68.8%, while women living in rural areas had support of medical personnel in only 32.1% at delivery.

Beside these socio-economic and household factors quality of care, with inadequate staffed and equipped health care facilities, is an important consideration in decision to seek care. The knowledge by own experiences or those of other people from the villages plays a role in the decision of seeking care for a woman.

2.1.1. Community dialogues in the villages

To create a consciousness of the population on existing problems of maternal and fetal morbidity and mortality Rotary International (RI) established different activities to inform the population on household, community and district levels about reasons and existing problems causing maternal and fetal mortality and morbidity.

The ministry of health in Abuja, the Local Government Officials, Chiefs and Village Heads, Commissioners of Health and of Women Affairs and the Hospital Management Board of Kano and Kaduna States got informed about the project and activities planned in the villages.

Fieldworkers remind Local Government Officials, Chiefs and Village Heads to recognize the responsibility of them for antenatal care and safe deliveries of their women and daughters.

Since 2008 a chief midwife carries out community dialogues in the villages in Kano State and Kaduna State in northern Nigeria within the catchment’s area of the ten hospitals, participating in the project of quality assurance since 2008. The chief midwife informs women, men and young person of the village communities, as well as traditional birth attendants (TBA’s) about different topics of pregnancy, e.g. nutrition during pregnancy, importance of antenatal care and presence of medical personal during labor and delivery [7].

Beside community dialogues in July 2007 Population Media Centre (PMC) launched its second social content radio serial drama in Nigeria: “Ruwan Dare” (“Midnight rain”), an “awareness program” financed by the Packard Foundation. “Ruwan Dare” focuses on promoting reproductive health, enhancing knowledge and use of family planning services, and prevention of HIV/AIDS [17].

2.1.2. Community dialogue in Kuyello village

Report compiled by P.E. (Field Liaison officer Kaduna State) on community dialogue held at Kuyello, Birnin Gwari Local Government Area in Kaduna State on the 9th December 2009:

Figure 3a+b: *Kuyello community*

“We arrived at Kuyello community after visiting General Hospital Birnin Gwari at 3:05pm; we were received by the District Head. He said they got our message from the MCH coordinator but that she did not state time of arrival, so, some women had waited, decided to go back home. However, he sent words across to the men and women who later converge upon the delivery of the message from the District Head. The meeting was held at the District Head palace. The purpose of our visit wasn’t new to them since we had visited the community before and so Z.P. introduced the two new faces in the team, which was Prof. W.K. and S.A.”

Five Rotary International team members visited the community.

“Z.P. tried to find from those present at the previous dialogue on what was discussed but no one could say anything and so, run through the issue discussed again but this time in summary:

- *Poor antenatal care (ANC) attendance*
- *Maternal mortality record from our partnering hospitals*
- *Poor hygiene status of women*
- *Poor hospital delivery*
- *Poor balance diet*

Figure 4: *Community dialogue in Kuyello*

Z.P. said poor antenatal care (ANC) attendance has been the root cause of most maternal mortality; this is so because most complications in pregnancy could be detected when the woman goes for ANC as routine check. It will be performed on the woman during ANC. She said the women can forgo a day in a month to attend ANC saying it is no long frequent as it was before. ANC is necessary just for four to five times during her pregnancy and nursing period.

She explained that most women die from eclampsia, hemorrhage and anemia, saying all of these causes of maternal mortality can be prevented if only the women would go for ANC and also deliver in the hospital. She said most of the defaulters of ANC attendance are the Hausa/Fulani women; hence, her message is targeted on them. She also pleaded with the Hausa/Fulani men to ensure that they allow their women attend ANC and also deliver in the hospital.

She said the cause of eclampsia is not pathogenic, but could be detected when they go for ANC and urinalyses are carried out on their urine and their blood pressure (BP) tested, it can be prevented. She told them of the risk of the eclamptic fits which made most eclamptic patients fall into wells or fire while doing their domestic chores, she also elaborated on some other issues like vesico-vaginal fistulas (VVF) saying that the Hausas marry their children at an early age, these girls get pregnant and refuse to go for ANC and/or refuse to deliver in the hospital where they could receive help to perform Caesarean section (CS) if the woman cannot deliver on her own due to small pelvic bone or flat pelvic bone of the mother. This could prolong the labor if left at home causing vesico-vaginal fistulas (VVF) or recto-vaginal fistulas (RVF).

She said women are made with different pelvic bones, some flat, some other like that of men and others are normal, but yet complication could still arise that the traditional birth attendants (TBA’s) may not be able to manage except a skilled midwife. She spoke on fetal presentation, breech presentation, cephalic and transverse lay, saying that fetus may come with the hand, buttocks or face instead of the head in normal delivery, to this the midwife could perform external cephalic version; and some fetus will get the umbilical cord twisted around their neck. This can also bring about prolonged/obstructed labor leading to the death of the fetus or both, mother and the fetus. She said in cases where the mother survives but the baby is dead in the uterus, the midwife performs what is known as decapitation. She said bleeding may occur due to placenta previa.

Figure 5a+b: *Z.P. (chief midwife) speaking to the women, men and children of the community of Kuyello village*

Z.P. spoke on family planning saying that spacing ones child help the mother regain more strength to go into another labor. Frequent deliveries can bring about prolapsed of the uterus, as she compared the uterus to the elastic band of the under-wear of the women. Wearing it and washing it too many times makes the elastic band to slack.

She spoke on the importance of good balanced diet, she said anemia may come from lack of balanced diet which could be gotten from the available plants and food stuff within the reach of the women but since they don’t for ANC they may not be taught how to mix the food to get balanced diet.

She spoke on personal hygiene, saying that keeping the environment clean and take ones bath when he/she should can help prevent infection and clean of the drainages and cutting down of grasses can help prevent malaria as mosquitoes wouldn’t have breeding places.“

Questions, Suggestions, Request and comments:

Yusuf Abubakar: “*Request Rotary International to improve and renovate their primary health care centre (PHC) as it is the only hospital where the whole of the district attends when ill and for ANC and delivery. Over 150 women attend ANC daily but the dilapidating building is very worrisome.”*

Figure 6a: *Primary health care centre in Kuyello*

Figure 6b: *Women and children in hospital bed*

Dantanimu Musa Kuyello: “*He comments on Rotary International (RI) initiative to hold community dialogue in some selected communities, he said they have volunteer village health development committee which he happens to be a member. They hold meeting occasionally and discuss ways to improve on hospital attendance and encourage the women and men to always use the hospital as it is their right and that is why it is built in the community. He pleaded with us not stop visiting as some organizations would come and when their impact is been felt by the community they stop coming.”*

Inusa Mohammed: “*He suggested that whenever there’s going to be a visit of this kind that inform them properly and in good time so that we can have a good turn out as the information is vital to members of the community.”*

Musa Abubakar: “*He said he would like Rotary International to renovate and employ more health personal in their health centre as more than 50 patients visits the centre daily and only two personal are often on duty to attend to this number, he said the clinic is short staffed.”*

Rukkaya Inusa: *“She said the reason the women don’t attend ANC sometimes is that the men send them to the clinic without money for transport or money to pay for drugs, she said this sometimes discourage the women from attending ANC and deliver in the hospital.”*

Figure 7a: *Pharmacy of primary health care centre*

Figure 7b: *Primary health care centre in Kuyello*

“To Rukkaya Inusa’s comment, the men said often times the drugs paid for the women don’t even take them.

To the above comments and suggestions, Z.P. answered them as best as could and she said in the future if Rotary International is going to collaborate with Local Government owned hospital such as PHC centers and the comprehensive health centers in quality assurance, we shall pick their centre and improve on the structure.

A bag of mosquito nets and two bags of birth kits (which includes hand gloves, soap, a razor blade, spirit, three hand towels, a cord ligature, a hand brush, cotton wool, three plastic containers and a piece of cloth for raping the baby) for expectant mothers, who are in their third trimester, were donated. We told the women to come to the District Heads’ palace to collect birth kits when they are in the third trimester or when they experience any sign of labor. The District Head on the behalf of the community members expressed their delight on our visit and for the birth kits and mosquito nets we donated to the community for expectant mothers.”

2.2. Second delay: Transport to the hospitals

After the decision of the women in labor and/or their relatives to seek care of medical personal, the second delay can occur by reaching an adequate health care facility in time. The problems associated with the second delay are all kind of physical accessibility factors including the distribution to facility, travel time from home to facility, availability and cost of transportation and conditions of the road [1].

An uneven distribution of facilities is an acute problem in most developing countries [1]. In Nigeria, with a population density of 152/km² [8], this problem exists especially for rural inhabitants who have long travel distances for the access to adequate health care facilities.

As primary health care centers in the villages are mostly insufficiently equipped and staffed for a sufficient maternal care, as described in the “community dialogue” by members of the village, women have to travel long ways to reach a secondary or tertiary health care facility.

In a study in northern Nigeria by *Turkur et al.* [9], who examined the pattern of eclampsia, reported of 56% of the patients, who had a delay in reaching medical facilities. Delay in reaching medical facility was defined as inability to reach the hospital from home within three hours. From the records in this study it was not possible to determine those who had delays after arrival at the facility before accessing care.

Public transportation is inadequate in most regions in rural areas in northern States; lack of transportation vehicles in the villages strengthens the problem of reaching health facilities in some cases.

In addition, even if decision is made to seek care and vehicles for transportation of the patients to the health care facilities are available, bad roads render some areas inaccessible [10]. Especially the rainy season, which lasts from April to August in Nigeria, with shorter rains in September and October, makes transport to an arduous task or even impossible in some cases [11].

For reasons of first and second delay home deliver is still the norm throughout northern Nigeria. *Galadanci et al.* [12] reported a home delivery rate of 85.3% within the States in northern Nigeria. A total of 80.5% of the women delivered with the attendance of personnel with no verifiable training in sanitary birthing techniques. Traditional birth attendants (TBA’s), village health workers, parents, neighbors and other relatives have to assist and decide in critical moments of deliveries.

2.3. Third delay: Insufficient care of the patients in the hospitals in Northern Nigeria

The third delay leading to maternal deaths occurs in the health care facilities, i.e. the delay in receiving adequate and appropriate treatment at the facilities. It includes different factors such as shortage of supplies, equipment, drugs and blood products, trained personnel, and competence of available personnel [1].

In a recent study of the Federal Ministry of Health (FMOH) [13] in Nigeria, the proportion of facilities that met basic essential obstetric care services (BEOC) and comprehensive essential obstetric care services (CEOC) were examined.

Signal functions to fulfill basic essential obstetric care (EOC) services are:

- Administer parenteral antibiotics
- Administer parenteral oxytocic drugs
- Administer parenteral anticonvulsants for pre-eclampsia and eclampsia
- Perform manual removal of the placenta
- Perform removal of retained products
- Perform assisted vaginal delivery

Signal functions to fulfill comprehensive EOC services are all services included in basic EOCS, additional functions are:

- Perform surgery (Caesarean section)
- Perform safe blood transfusion

The proportion of facilities that met basic EOCS was 1.2% for public facilities and 5.3% for private facilities; 3.9% of public facilities and 27.5% of private facilities fulfill the signal functions for comprehensive EOCS [13]. Thus 94.9% of public facilities and 67.2% of private facilities could not fulfill the basic essential signal functions for obstetric care, which signify the lack of necessary components for a sufficient maternal care.

These results were confirmed at the visits of the ten health care facilities, participating in the data collection in obstetrical management, in Kano State and Kano State in December 2009. A lack of essential equipments, e.g. scales for mothers and babies in the delivery room, suction machines in operating theatres, delivery instruments, lack of power and water supply lack of emergency care services (anti-shock garments and blood products) could be observed. Neonatal care units were mostly not available or in some cases, if available, insufficient equipped, e.g. lack of incubators and instruments for ventilation and intubation of the babies.

Additionally laboratories were not well equipped in most health care facilities and the status of hygiene in the hospitals needed major improvement in most cases.

The Federal Ministry of Health represented data of proportions of health workers, which are trained in life saving skills in the study on essential obstetric care facilities in Nigeria in 2003 [13]:

Only 10.2% of the non-specialist physicians had extended life saving skills, 9.9% of the midwives had live saving skills (LSS) and 4.5% of the community health workers (CHEWs) had modified life saving skills. The Federal Ministry of Health noticed that extended life saving skills initiative commenced within the last three to four years before the study was carried out and in the States where the program has been operating there is the aim of training all doctors in the shortest possible time [13].

A lack of equipment and trained attendants at delivery can lead to appalling consequences for women during delivery, e.g. in case of postpartum hemorrhage, which is the major cause of maternal morbidity and mortality worldwide with the highest incidence in developing countries [14]. The availability of emergency obstetric care including blood products and anti-shock garments and the application of these life-saving measures are urgently necessary in case of postpartum hemorrhage to safe mother’s lives.

Onah et al. [15] emphasizes in the study of “Maternal mortality in health institutions with emergency obstetric care facilities in Enugu State, Nigeria” the third delay as the most common type of delay. A delay in institution management was observed in 52.8% of the women participating in the study.

A good management of health care facilities is the basis for offering a sufficient quality in health care. Provision of basic equipments and training of health care personnel, e.g. life saving skills for doctors and nurses is the responsibility of the government. An important factor for reducing maternal mortality is the increase of hospital deliveries. To reduce particularly the “first delay” the health care facilities need the confidence of pregnant women in maternal health services in the hospitals, which can only be reached by scaling up the system of obstetric health care in the facilities.

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3. Obstetric fistula – a result of insufficient care during labor

3.1. Epidemiology and causes of obstetric fistula

3.2. Methods and instruments for data collection

3.3. Classification and treatment of vesico-vaginal fistulas (VVF) and recto-vaginal fistulas (RVF)

3.3.1 Classification of VVF and RVF
3.3.2. Obstructed labor injury complex
3.3.3. Female genital cutting ("Yankan gishiri")
3.3.4. Methods of treatment

3.4. Results

3.4.1 Residences of the treated women
3.4.2 Age distribution of the treated women
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- Age distribution of the operated women
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- Recurrence - operations after VVF- operations
- Recurrence - operations after RVF- operations
- Frequency of VVF- and RVF-operations

3.4.6. Distribution of nerve injuries ("drop foot")
3.4.7. Distribution of urethra lengths (EUO/B) and longitudinal diameter measured on the basis of urinary catheter

3.5. Discussion and conclusions

3.6. References

3. Obstetric fistula- a result of insufficient care during labor

3.1. Epidemiology and causes of obstetric fistula

Obstetric fistula is an abnormal connection between the bladder and the vagina (vesico-vaginal fistula = VVF) or between the vagina and the rectum (recto-vaginal fistula = RVF). There are many reasons for developing fistulas; however the main cause, particularly in developing countries, is necrosis of the genital tissue due to obstructed labor. Prolonged obstructed labor also is the most important cause of developing a fistula in northern Nigeria (83.8–96.5%) [1,2]. Obstructed labor results in pressure induced ischemia and necrosis of the vagina and bladder, because the tissue of the vesico-vaginal septum is compressed between the fetal head and the mother's pubic bone. If this condition continues over long time (sometimes three to four days or longer) it leads to massive tissue damage with the consequence of the formation of a hole in the vesico-vaginal or recto-vaginal septum (or sometimes both). The consequence is incontinence of the mostly young women. In addition, the necrosis can lead to an "obstructed labor injury complex" comprising damages in the urological (e.g. total urethral loss), gynecological, gastrointestinal, neurological (e.g. drop foot) and musculo-skeletal systems [3,4].

Goh [5] reported an average duration of labor of 3.6 days in those cases, where women developed an obstetric fistula. In almost all these cases the unborn baby died.

Other causes for obstetric fistula are surgeries like hysterectomy, colporrhaphy and Caesarean section and malignancy, radiation therapy, trauma, congenital malformation and infection [6].

As shown in a study by *Wall* [1] in Jos in Nigeria only almost half of the women with a vesico-vaginal fistula had a spontaneous delivery (49.7%), more than half of the women underwent different ways of operative deliveries like Caesarean section (40.3%), forceps delivery (9.1%) and deliveries with a vacuum extractor (0.7%). Access to health care centers with the possibility of conducting a Caesarean section is one of the most important tasks for maternal health care. This study shows that a Caesarean section does not prevent the complications of obstetric fistula in all cases, especially if the women were in labor for several days and the tissue of the vesico-vaginal septum was already damaged. The Caesarean section rate is very low in developing countries and there is shown a high ratio of Caesarean sections between the richest and poorest populations within the countries. In Nigeria there was described a ratio from 8.3 between the richest quintile and the poorest quintile. The richest 20% of the Nigerian women had a substantially better access than the poorest women in the country [7].

Genital mutilation also is one but not a major reason for fistula (see 3.3.3. Female genital cutting). In northern Nigeria a traditional practice called `yankan gishiri´ is conducted among certain tribes. Several cuts in the vagina using a razor blade, a knife or other sharp instruments are used to facilitate the birth passage. Besides a major blood loss and dangerous infections, problems occur for the women after the genital mutilation, i.e. fistula can be a result of this practice [8].

It is estimated that there are up to 2 million women suffering from obstetric fistula worldwide [9] and 1.5 million women in Africa [10]. 200,000 women in Nigeria are currently awaiting surgical repair of their fistula [11]. Recent estimates reveal an incidence of at least 50,000 new cases each year worldwide [10] and at least 33,000 new cases in sub-Saharan Africa each year [11]. Various studies from northern Nigeria showed that vesico-vaginal fistula is a major obstetrical problem in this region [1,2].
It is estimated for every women that dies in labor approximately 20 women suffer from consequential damage like fistulas caused by prolonged labor without sufficient treatment [9].
A recent paper shows, that the calculation of the incidence of obstetric fistula is difficult [12].

Between the 17th and the 19th century the problem of obstetric fistula also affected much of the United States of America and Europe [9]. Fistulas, which arise from prolonged obstructed labor, almost do not exist anymore in the industrialized countries by the middle of the 20th century as a result of the improvement of the effective medical care in obstetrics [13].

The “typical” patient for obstetric fistula in the developing countries is a poor, young, primapara, illiterate women with a short stature living in a rural area, mostly married in young age [14,15]. As shown in many studies fistula frequently arise among young women living in rural areas with a limited access to the health care system. Often the socioeconomic status of the women is low and they are not informed about family planning and contraceptives are limited or nonexistent resulting in a high fertility rate. The women often get married in very young age and get pregnant before the maturation of the pelvis is completed. As described in a study by *Tahzib* [2], 32.9% of the patients were aged less than 16 years when the fistula occurred during labor, among them mostly primaparous women (52.1%). *Wall* [1] described in a study in the town of Jos in Nigeria that 72% of the women did not receive any antenatal care.

In northern Nigeria primary health care centers exist in some villages, but mostly without a sufficiently trained midwife and insufficient equipment for maternal care during pregnancy and labor. Secondary and tertiary health centers are often far away from the villages and transportation to these centers is associated with expenses for the families. Therefore the young girls and women in these areas regularly deliver the babies with the support of a traditional birth attendant (TBA) or experienced family members. Sometimes the women are even alone.

An untreated fistula results in devastating social consequences for the afflicted women. These women are often forced to live in appalling conditions. The development of a fistula is accompanied with a fetal loss in 85% to 92% of all women [1,16,17].

Women with a vesico-vaginal fistula are in general suffering from different problems like urethral or rectal incontinence, infertility, amenorrhea, infection, the loss of sexual function due to stenosis and shortening of the vagina and neurological injuries like foot drop [18]. Many women experience a social stigma: the loss of family and their husband, most live separated or divorced from their husbands, some lose their place in society and are forced to leave their community. Consequently some live in poverty, are malnourished and suffer from psychosocial trauma [17].

3.2. Methods and instruments for data collection

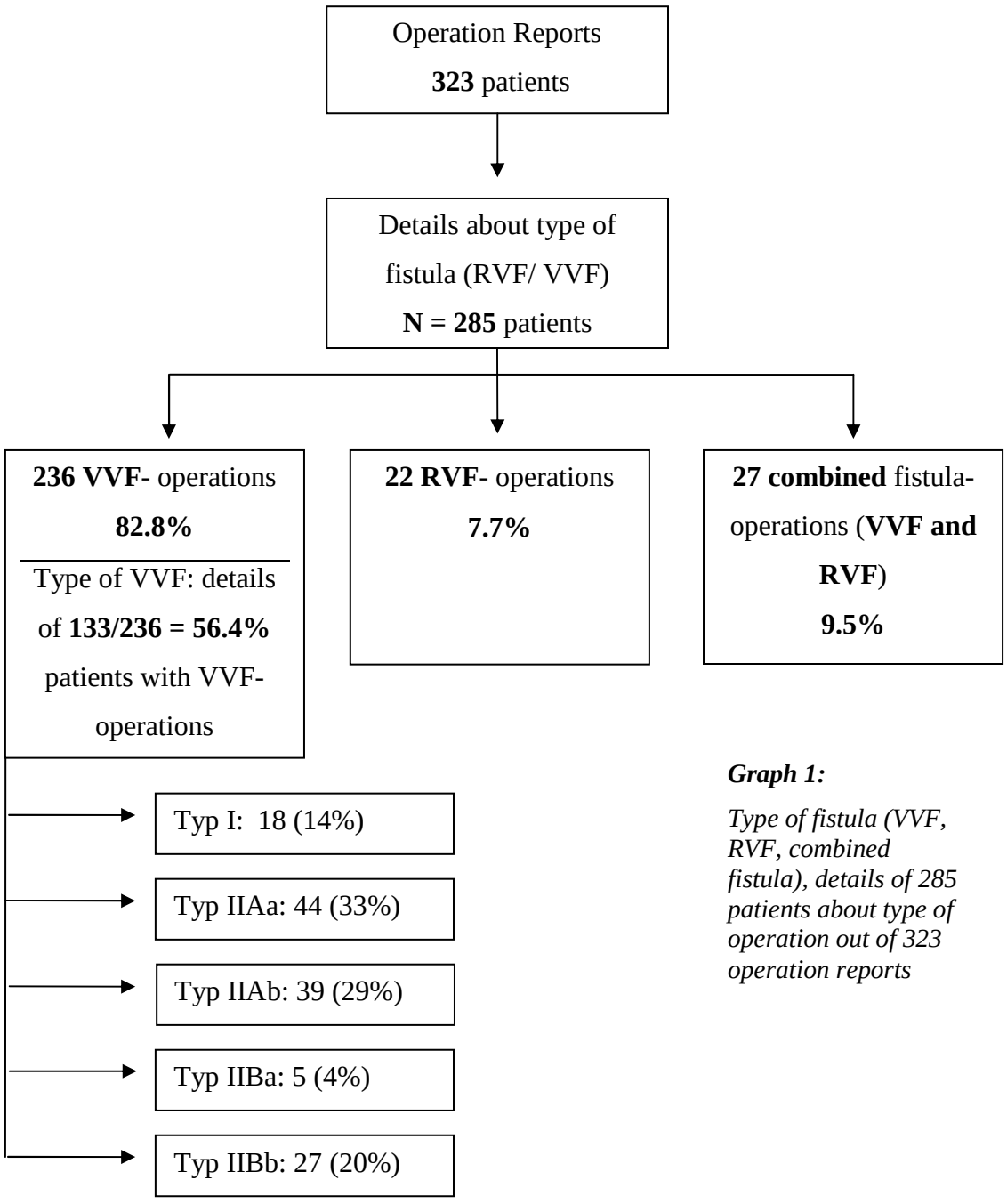
In the descriptive study 323 fistula treatments from two hospitals in northwest of Nigeria were analyzed. The operations were conducted in Rotary Fistula Centre Wudil in Kano State, approximately 50 km southeast of the city Kano, and in Rotary Fistula Centre Zaria, the Rehabilitation Centre Kofan Gaya (Hajiya Gambo Sawaba) in Kaduna State, approximately 70 km north of Kaduna. All patients were treated between October 2007 and July 2009. The operations were financed by the fistula project from Rotary International and carried out by Dr. Waaldijk, a European specialist, and by trained gynecologists from Nigeria.

In both hospitals formal ethics committee is not available. Approval was obtained from the hospital directors and the surgeons who carried out the operations.

Data were collected from 323 patient reports including patients` characteristics, i.e. age, residence, number of pregnancy, number of living children and height of women. There was the necessity of operation of 285 among all 323 patients. The diagnosis with side, type and classification of fistula was assessed under spinal anesthesia, which is conducted just before vaginal operation. The fistulas were classified according to their anatomical location and size. The classification system was first proposed and used by Waaldijk (see 3.3.1.). Symptoms like the duration of urine incontinence and stool incontinence were recorded if possible. The intrapelvic peroneal nerve trauma (“drop foot”) was categorized if achievable from grade 0 to 5 by muscle testing: grade 0 was no function whatsoever; grade 5 was a normal function. The duration of operation, anesthesia and description of operation including the use of a catheter and data about bladder capacity were recorded. All patients were operated under spinal anesthesia. After operation transurethral Foley balloon catheters size 18 were inserted in all cases.
The records of all patients were collected and all entered into an Excel spreadsheet. Mean median, range and percentages of the collected data were reported.

The median age of the women was 21 years, range 10 to 70 years. The height of the patients varied from 1.32 cm to 1.72 cm with a median height of 1.54 cm.

Out of 323 patients there were 285 with detailed information about the type of fistula (graph 1). 236 patients (83%) had a vesico-vaginal fistula, 22 (8%) had a recto-vaginal fistula and 27 (9%) had combined fistulas (VVF and RVF). Out of the 236 patients with vesico-vaginal fistulas detailed information about the type of fistula exists of 133 (56.4%) patients:
Type I: 18 (14%), Type II Aa: 44 (33%), Type II Ab: 39 (29%), Type II Ba: 5 (4%), Type II Bb: 27 (20%) and no patients with Type III- fistulas (0%).



Graph 1:

Type of fistula (VVF, RVF, combined fistula), details of 285 patients about type of operation out of 323 operation reports

Detailed information about the number of pregnancies exists for 213 (65.9%) patients out of 323 operation reports. The number of pregnancies ranged from 1 to 16 in all patients with a median of three pregnancies. The number of living children of the 143 patients ranged from 1 to 9, 35% of the operated women did not have one living child and 23% of them had only one living child. The number of dead children ranged from 1 to 12 and 18% of the women did not have a dead child. This means, 82% of the women did have at least one stillbirth or dead child ranging up to 12 dead children in one case.
There was detailed information of 136 patients about intrapelvic peroneal nerve trauma, which is categorized from grade 0 to 5. Approximately 50% of these patients had a normal function without any restrictions; all other patients had different stages of restriction at least at one side.

The longitudinal diameter, a measure to estimate the bladder capacity, was calculated by measurement of the distance between the external urethra opening (EUO) and the bladder wall (BW), measured by a calibrated metal sound, minus the distance between the external urethra opening and the balloon (B) of the transurethral catheter [6]. The calculated longitudinal diameter of the bladder (EUO/BW– EUO/B) ranged from 4 cm to 19 cm with a median of 10 cm.

- EUO = external urethra opening
- EUO/B = distance between EUO and balloon
- EUO/BW = distance between EUO and bladder wall
- Longitudinal diameter = EUO/BW – EUO/B

The bladder capacity may play a role in the outcome for the patient. If the bladder capacity is too low, urge incontinence may develop. If it is increased, stress or overflow incontinence may be expected. The “bladder capacity” can be estimated according to the longitudinal bladder diameter as:

- Small ≤ 4 cm
- Moderate 5-6 cm
- Normal 7-12 cm
- Increased > 12 cm

Measuring the bladder capacity in this way is not an exact parameter of bladder volume, but it will give a good approximation of the bladder capacity. In addition, there is a possibility of discovering a bladder stone by metal sounding before operation is started [6].

The urethra lengths can be measured with the transurethral balloon catheter. The distance between the external urethra opening (EUO) and the balloon of the catheter inside the bladder is the urethra lengths (EUO/B).
The critical length of the urethra (EUO/B) regarding the post repair incontinence is 1.5 cm (Figure 8a+8b). The normal lengths of the female urethra should be between 3 and 5 cm.

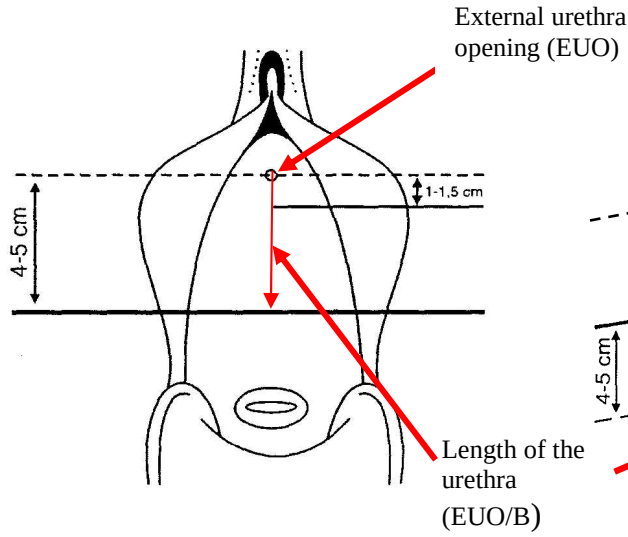


***Figure 8a**: continence/closing mechanism frontal (by Waaldijk)[6]*

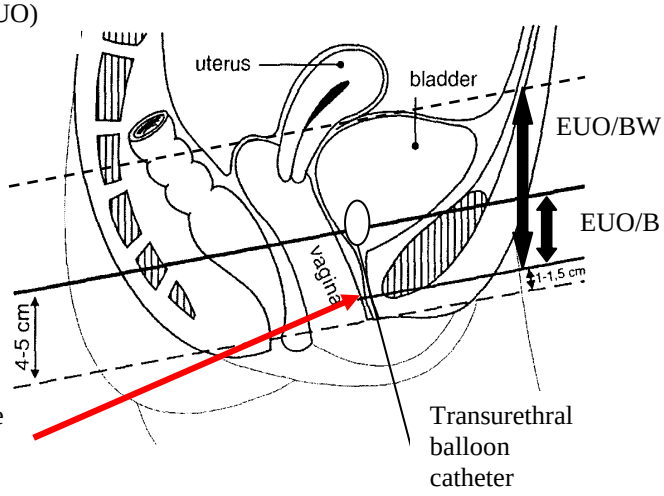


***Figure 8b**: continence/closing mechanism sagittal (by Waaldijk) [6]*

3.3. Classification and treatment of vesico-vaginal fistulas (VVF) and recto-vaginal fistulas (RVF)

3.3.1. Classification of VVF and RVF

The classification and description of vesico-vaginal and recto-vaginal fistulas is still not satisfactory, because there is no generally accepted classification system for fistulas. Fistula surgeons have mostly individualized systems of staging fistulas and there is no evidence base for decision making [9]. Currently, there are two accepted classification systems used for fistula classification:

I. *Goh´s* Classification [19] of female genito-urinary tract fistula is based on three parameters:
    1. *Type:* distance from fixed reference point; external urinary meatus
    2. *Size:* largest diameter in centimeters
    3. *Special considerations:* fibrosis, reduction in vaginal length/capacity and special circumstances

II. Surgical classification of obstetric fistulas by *Waaldijk* [20], according to anatomic/physiologic classification of the fistula.

Operations in the present study were validated by *Waaldijk´s* classification system. All recorded fistula operations were carried out by Dr. Waaldijk and gynecologists trained by him.

The *vesico-vaginal fistula* is associated with continuous leaking of urine through the vagina 24 hours a day, which cannot be stopped or cleaned. The symptom of the *recto-vaginal fistulas* is an intermittent passing of stool from the vagina, which can be stopped and cleaned. The distribution of vesico- and recto-vaginal fistulas shows a considerably more frequent appearance of isolated vesico-vaginal fistulas (83%). Isolated recto-vaginal fistulas appear in 8% and cases with a combination of VVF and RVF exist in 9% [6].

The examination of the fistula is carried out under anesthesia at the beginning of the operation in the lithotomy position with the legs fixed and slightly abducted in stirrups. The fistula is classified and a final decision is taken how to treat the specific type of fistula [6].

The classification system for **vesico-vaginal fistulas** and **recto-vaginal fistulas** by *Waaldijk* [6] is used in this study, according to the anatomic/physiologic location:

	A. Vesico-vaginal fistulas	**B. Recto-vaginal fistulas**
I	Not involving closing mechanism	Proximal fistulas **a** without rectum stricture **b** with rectum stricture **c** with circumferential defect (very seldom)
II	Involving closing mechanism **A** without (sub)total urethra involvement **a** without circumferential defect **b** with circumferential defect **B** with (sub)total urethra involvement **a** without circumferential defect **b** with circumferential defect	Distal fistulas **a** without sphincter ani involvement **b** with sphincter ani involvement
III	Miscellaneous, e.g., ureter and other exceptional fistulas	Miscellaneous, e.g. ileouterine fistulas after instrumental abortion

Table 1*: Classification system for vesico-vaginal and recto-vaginal fistulas*

Within this classification it is further possible to group patients according to the size of the defect:

- small < 2 cm
- medium 2-3 cm
- large 4-5 cm
- extensive ≥ 6 cm

3.3.2. Obstructed labor injury complex

The development of fistulas is not the only injury that arises as a consequence of obstructed labor. The tissue damage causes a wide range of injuries, which frequently appear in connection with fistulas. The cascade of related multisystem injuries is known as the "obstructed labor injury complex" including amenorrhea, infertility, shortening or stenosis of the vagina, damage to the pubic symphysis and foot drop caused by compression of the nerves supplying the lower extremities [13]. In addition, a vesico-vaginal fistula can lead to dermatological damages with the consequence of exfoliated and edematous skin at the external genitalia, the buttocks and thighs [8].

The **intrapelvic peroneal nerve trauma** resulting in drop foot is created due to the compression of the lumbosacral plexus between the fetal head and the maternal bony pelvis. The peroneal nerve is divided into the superficial peroneal nerve which is serving the Musculi tibialis anterior, extensor digitorum longus and brevis, peronaeus tertius, extensor hallucis longus and brevis muscles. The deep peroneal nerve innervates the peroneus longus and peroneus brevis muscles. The damages of these nerves possibly result in atrophy of the muscles with weakness or loss of dorsiflexion and eversion of the foot. If the patient is immobilized because of the damage of these nerves the Achilles tendon will shorten and contract. The ankle becomes fixed in an incesion- plantiflexion position [6].
There is a high incidence of peroneal nerve trauma in association with a fistula. More than 50% of patients treated within this study showed different degrees of peroneal nerve injuries.
The grading of muscle power is measured by using the Medical Reasearch Council scale 0-5 whereby [21]:

grade 0 = no contraction, no function
grade 1 = flicker or trace of contraction
grade 2 = active movement, with gravity eliminated
grade 3 = active movement against gravity
grade 4 = active movement against gravity and resistance
grade 5 = normal power

Since the nerve healing cannot be influenced there is only the possibility of spontaneous recovery. Improvements are seen in over 90% within up to 2 years. The active muscle exercises by immediate mobilization will prevent major muscle atrophy and contracture of the ankle [6].

The sacral plexus trauma arises from the compression of the sacral plexus between the fetal head and the maternal bony pelvis. It can lead to overflow incontinence, major or minor stress incontinence, sphincter ani paralysis with stool incontinence or saddle anesthesia of the vulva, perineum or buttock, which possibly results into ulceration due to anesthesia. Also the sacral plexus trauma heals spontaneously in most patients [6].

Another neurologic trauma due to obstructed labor is the anesthesia of the vagina; probably a result of a trauma to the nerve endings in the vagina walls, in generally it lasts for 4-6 weeks after delivery [6].

3.3.3. Female genital cutting ("Yankan gishiri")

The female genital cutting, also known as female genital mutilation, refers to "all procedures involving partial or total removal of the external female genitalia or other injury to the female genital organs for non-medical reasons."[22]
The female genital cutting is specified in four types by the WHO [22]:

- Type I exists in the partial or total removal of the clitoris and/or the prepuce (clitoridectomy).
- Type II is the partial or total removal of the clitoris and the labia minora, with or without excision of the labia majora (excision).
- Type III is a narrowing of the vaginal orifice with creation of a covering seal by cutting and appositioning the labia minora and/or the labia majora, with or without excision of the clitoris (infibulation).
- Type IV includes all other harmful procedures to the female genitalia for non-medical and reasons, like pricking, piercing, incising and stretching of the clitoris and/or labia, cauterization by burning of the clitoris and surrounding tissue, scraping of tissue surrounding the vaginal office (angurya cuts) or cutting of the vagina (gishiri cuts).
  Type IV also includes the insertion of e.g. caustic materials and various traditional medicines in the vagina to treat infertility, dysparunia and other complaints.

Female genital cutting is a common procedure mainly in African countries. More than ten million women worldwide are estimated to be suffering from genital cutting worldwide. Female genital mutilation is affected by different social and demographic factors. Particularly young women or girls with a low education level and low or medium socioeconomic status living in urban regions are suffering from the consequences of female genital cutting. The traditional practice is found in different religious affiliations with a diverse distribution of frequency in different tribes [23].

In northern Nigeria, Gishiri cut is a tradition carried out among the Hausa, Fulani and Kanuri tribes. It is usually carried out by traditional healers with the intention to "treat" miscellaneous complaints like obstructed labor, amenorrhea, infertility, dysparunia, dysuria coital difficulties, vulval rash, goitre and generalized body aches and pains. It is carried out by doing a series of cuts inside the vagina with a sharp instrument. The traditional cut may result in vesico-vaginal fistulas, hemorrhage or sepsis [1, 2 and 24]. The incidence of Gishiri cuts in Nigeria is not known and difficult to estimate. In our study details about Gishiri cut exist of 189 women, 22

of them (11.64%) underwent the traditional cut. These are data about women living in northern Nigeria suffering from a fistula, and this cannot be transferred to the general population in Nigeria.

It is difficult to assess the consequences for deliveries after genital cutting, since previous studies have been small and methodologically limited. The small number of studies shows a correlation between genital cutting and a higher risk of complications during birth [23]. Recently a WHO collaborative prospective study in six African countries shows that deliveries of women, who are affected by genital cutting, had a significant higher rate of Caesarean section, postpartum hemorrhage with more than 500 ml loss of blood, episiotomy and an extended maternal hospital stay. The infants of women who have undergone female genital cutting needed more frequently resuscitation after birth and there was a significantly higher rate of stillborn infants. There was no significant association between the infant birth weight and genital mutilation [23].

3.3.4. Methods of treatment

There are various ways for treatment and operation techniques of obstetric fistula carried out by different surgeons in the developing world.

The management of **vesico-vaginal obstetric fistula** with an immediate treatment of the fistula was developed between 1984 and 1992 according to the basic surgical principles: decompression of the bladder by catheter, debridement, early closure, high oral fluid intake and no antibiotics [25].

The first priority in the management of obstetric fistula should be an early closure of the fistula to save the women from being an outcast. Any woman who starts leaking urine following childbirth should have an indwelling catheter regardless of the cause of leaking: a fistula, stress incontinence or overflow incontinence (atonic bladder). At least 15-20% of the fistula heals by inserting an FOLEY catheter Ch 18 for a minimum of 4-6 weeks [6] immediately after leaking urine. During this time it should be examined once a week by the instillation of gentian violet to determine the prospects of spontaneous healing or fistula surgery. If fistula surgery is getting superfluous because the fistula heals by catheter, the catheter should left in for 2 more weeks before removing [25]. The catheter treatment with the chance of early closure of the fistula is well feasible even under primitive conditions.

The treatment of obstetric fistula includes a high oral fluid intake with a minimum of 6-8 liters per day, which already should start preoperatively [6].

Since the fistula is caused by pressure necrosis and not by infection systemic antibiotics are not necessary. Only on specific indications, e.g. pneumonia or puerperal sepsis, systemic antibiotics have to be given. As illustrated in a study by *Waaldijk* [25] in 2004, systemic antibiotics are not necessary during fistula repair: postoperative wound infections were not noted in 1716 patients and all the episiotomies were healed at suture removal seven to ten days after repair. High-protein diets as well as oral haematinics are useful to speed up recovery from the enormous trauma of prolonged obstructed labor. Important is the full mobilization of the patients, if needed with a stick, to avoid atrophy of the muscles and contracture of the ankles [6].

An early surgical fistula repair should be carried out, if there is no healing by catheter in 4-6 weeks and the wounds are clean. The objective of fistula surgery is not only the closure the fistula but also the continence of the patients.

Necessities for conducting a fistula operation: Electricity in form of a stand-by generator and operating lights should be guaranteed during operation. Necessary equipment for successful fistula surgery is a well functioning hydraulic operating table with 60° inclination as well as special surgical instruments (AUVARD speculum, long vaginal instruments, sharply curved THOREK scissors and a sharp DESCHAMPS aneurysm needle). An autoclave or sterilizer for instruments is necessary. For closing the fistula polyglycolic acid and nylon suturing materials can be used [6].

For fistula repair the patient is placed upon the operation table in the exaggerated lithotomy position with the legs fixed and slightly abducted in stirrups. The operation can be carried out under spinal anesthesia with hyperbaric bupivacaine 0.5% [6].

Firstly the fistula is classified by careful inspection with a speculum.

In principle, the dissection and operation become progressively more complicated from Typ I to Typ IIBb. The prognosis to close the fistula and continence of the women becomes progressively worse from Typ I to Typ IIBb. It also depends on the size of the fistula; smaller fistulas do have a higher success rate than extensive fistulas. The critical urethra lengths for continence after fistula repair is 1.5 to 2 cm (normal urethra lengths: 3.5-4.5 cm); if the urethra lengths is 1.5 cm or less there is only a little chance for the women to become continent after fistula repair [6].

The objective of operation is a water-tight closure of bladder and urethra, whilst only adaptation or half-open closure of the anterior vagina wall allows free spontaneous evacuation of small blood clots, tissue debris and bacteria.

According to *Waaldijk (2008)* [6]:
Various operating techniques are carried out depending on the type of vesico-vaginal fistula:

- Type I: bladder/urethra closure in direction to common sense, adaptation of the anterior vagina wall
- Type IIAa: transverse bladder/urethra closure, transverse repair of pubovesical fascia, transverse adaptation of anterior vagina wall
- Type IIAb: circumferential repair by end-to-end vesicourethrostomy, refixation of pubocervical fascia, transverse adaptation of anterior vagina wall
- Type IIBa: longitudinal (+ transverse) repair of urethra tissue, fixation of pubovesical fascia, flap for anterior vagina wall
- Type IIBb: longitudinal and circumferential repair + urethra reconstruction with other tissue (scar tissue, paraurethra tissue, bulbocavernosus muscle or bladder); often in two stages, refixation of pubovesical fascia, flap for anterior vagina wall
- Type III: ureter reimplantation or something else

After operation an indwelling bladder catheter (FOLEY catheter Ch18) should be left in situ for a minimum period of two weeks. The concentration of urine possibly results in problems like urinary tract infection with a shrunken bladder in the end, stone formation, severe urine dermatitis, offensive odor which results in more social outcast. Therefore a fluid intake of 6-8 liters per day should be continued postoperative for minimum urine output of 4,000– 6,000 ml per 24 hours [6].
A full mobilization of the patient on the morning after surgery is necessary. At discharge from the hospital, the women are instructed to continue drinking and passing urine regularly and to refrain from sexual intercourse for 4-6 months. The episiotomy sutures should be removed after 7-10 days, the catheter 2-4 weeks after operation. Intravaginal sutures can be removed one week after catheter removal. Afterwards there should be regular checkups at two weeks, six weeks, and ten weeks later, and after six months. Furthermore, the patient is instructed to come after three months amenorrhea and to go to the hospital as soon as labor pains starts to avoid a repeated formation of a fistula [6].

There is no distinction between vesico-vaginal and **recto-vaginal fistula** in preoperative preparation. The patients do need oral haematinics and high-protein diet. The anesthesia can be carried out with hyperbaric bupivacaine 5%. For operation the same position as for vesico-vaginal fistulas, the exaggerated lithotomy position with the legs fixed and slightly abducted in the leg holders, is necessary. Also special instruments and suturing materials do not differ from the operation of the VVF.
The objective of the operation of the recto-vaginal fistula is an air-tight closure of rectum.

Various operating techniques are carried out depending on the type of recto-vaginal fistula [6]:

- Type Ia: transverse closure of rectum
- Type Ib: with disruption of rectum stricture
- Type Ic: (abdomino-) vaginal approach with end-to-end anastomosis/colostomy
- Type IIa: longitudinal closure of rectum
- Type IIb: with sphincter ani/ perineal body reconstruction
- Type III: depending upon the situation

Perioperative 2g tinidazole per os and one shot of broad-spectrum antibiotics i.m. are given at the beginning of anesthesia/operation.
A colostomy is not curative, but can be helpful; it is only carried out if it can be guaranteed, that 2 weeks after colostomy the RVF is repaired and that four weeks after successful repair the colostomy is closed.
The patient should not have any solid food for ten days in order to have soft and less bulky stools. After repair antibiotics are not necessary, with the exception only on strict indication.

3.4. Results

3.4.1. Residences of the treated women

There was information about the place of residence of all 323 patients with a fistula operation evaluated between October 2007 and July 2009. The villages and towns were grouped into the different states of Nigeria to get a view over the origin of the patients. The origin of the patients operated in Wudil (State Kano) and Zaria (State Kaduna) are spread over twelve states in Nigeria; some patients had their residence in the neighboring countries Niger and Chad.

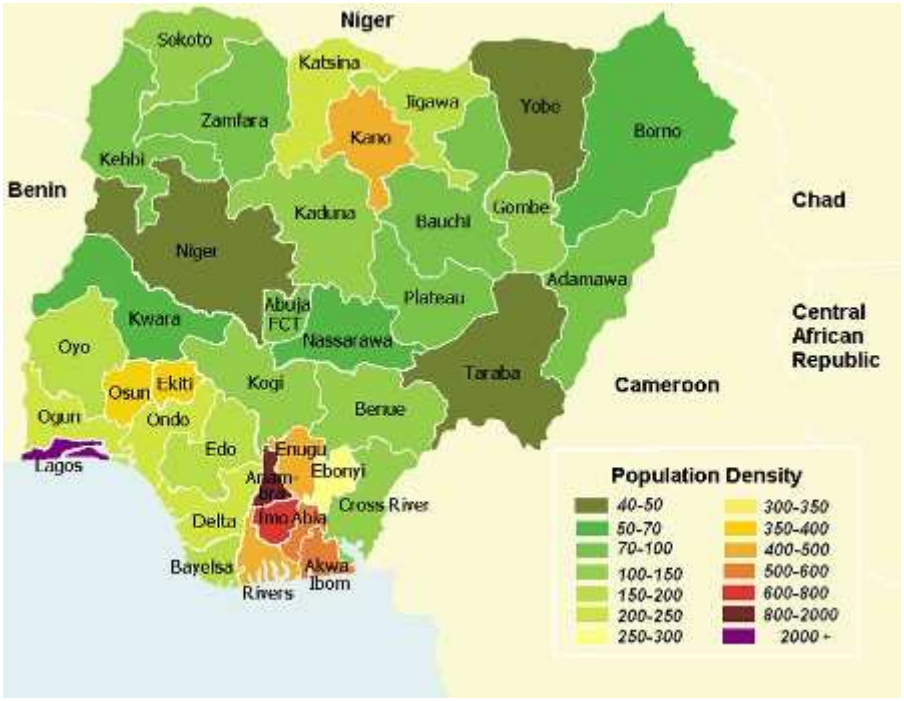


Figure 9:

Map of population density of Nigeria [26].
Kano State belong to the most densely populated states in Nigeria

Only one patient's origin was in Chad, six patients came from Niger to get operated in Nigeria. As expected, the largest number of patients had their origin in the state Kano (186 patients) and the state Kaduna (74 patients), both states where the operations take place. Beside them many patients came from different states in north-east of the countries, mainly the states Jigawa, Bauchi, Borno, Yobe and Katsina.

Figure 10 shows the distribution of the places of residence of all patients with a fistula operated in Wudil and Zaria between October 2007 and July 2009. 277 patients (85.67%) came from the States Kano, Kaduna and Jigawa. Most of the patients, 186 (57.95%) had their residence in Kano State.

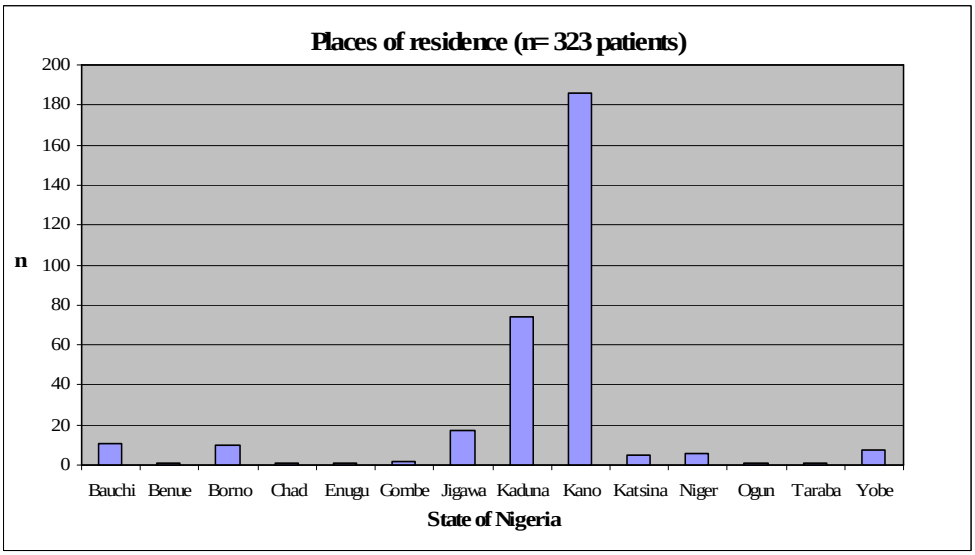


Figure 10:

Place of residence of all treated women. 186 patients (57%) came from the States Kano, Kaduna and Jigawa.

3.4.2. Age distribution of the treated women

The age of all women (n = 323) treated in the hospital ranged from 10 to 70 years, with a median age of 21 years and a mean age of 24,3 years. The distribution shows that mostly very young women suffer from obstetric fistula; almost half of them (48.9%) were 20 years old or younger, when they get hospitalized to treat their fistula. The age distribution shows a peak at the age of 15 years, which also emphasizes the problem of very young women, who suffer from obstetric fistula mostly after first pregnancy. The formation of obstetric fistula in this young age can be caused by a pregnancy in a very young age when the pelvis is not fully developed and the fetal head is caught in the narrow mother's pelvis.

Figure 11 shows the distribution of age of all 323 patients treated in Wudil and Zaria. There was no necessity of operation for all patients, because 38 patients (11.8%) could be treated by insertion of a catheter.

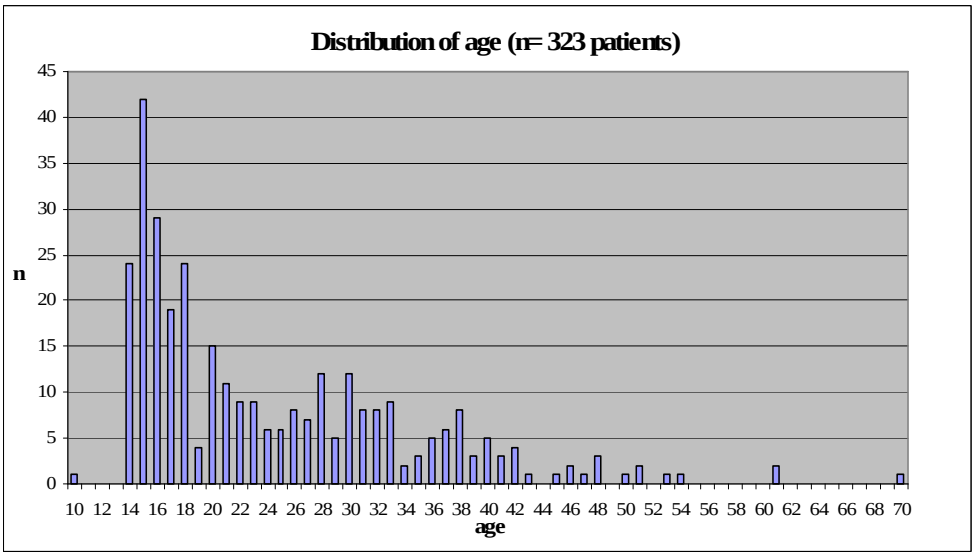


Figure 11:

Age distribution of treated women. The majority of the women (n=158, 48.9%) are 20 years and younger than 20 years.

3.4.3. Number of living and dead children in relation to the mother's age

Among 323 operated women in Wudil and Zaria there were details of 143 women about the number of living children of each women. The number of children, who were alive, ranged up to nine children. There was one woman in the age of 38 years with nine children and four women between the ages of 31 to 48 years, who had eight children. As expected very young women have less living children or only one living child, while adult women have a bigger chance of having children, who are still alive.

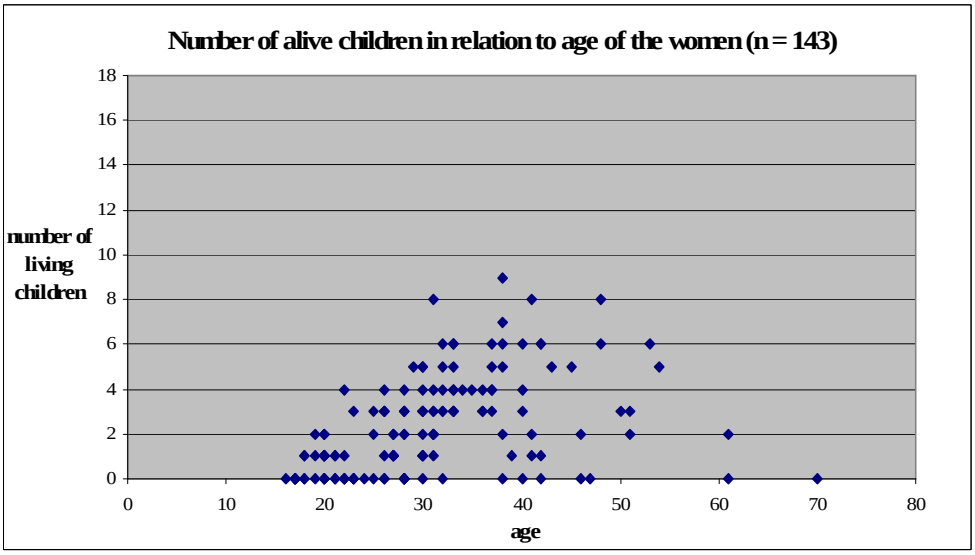


Figure 12:

Number of children (alive) of 143 women related to maternal age.

Figure 13 shows the number of dead children in relation to the age of the women, there were details of 179 women about the number of dead children. All 219 women, with an existing problem of obstetric fistulas, gave birth to a total of 912 children. More than half of them (55.2%) died from different reasons. As shown in the following graph the problem of giving birth to a dead child is a problem which affects women in each age, but mainly this is a problem in a very young age of the women, as also the fistulas are.

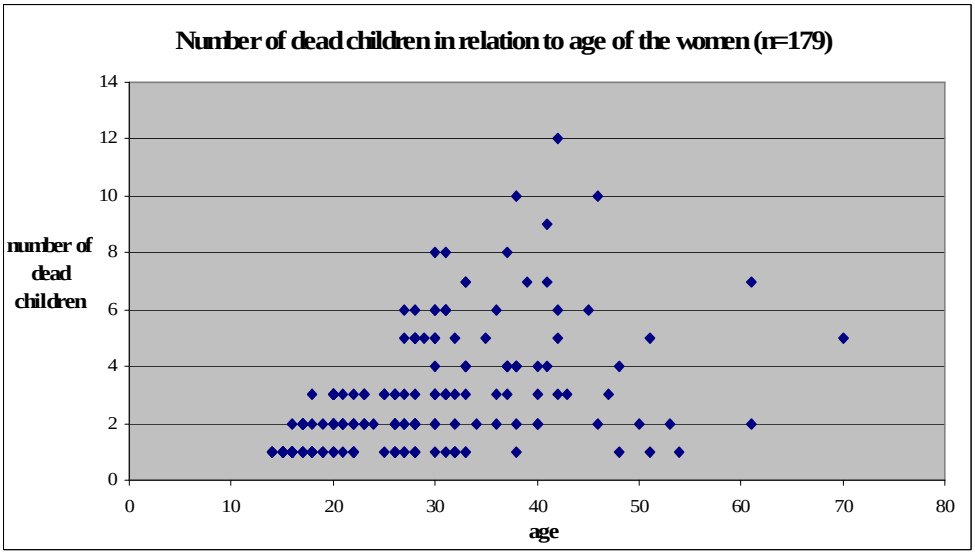


Figure 13:

Distribution of number of dead children in relation to maternal age; details of 179 women with at least one dead child.

3.4.4. Frequency of pregnancies and number of children

Detailed information of 213 women out of 323 fistula patients about the frequency of pregnancy exists. These details did not give any information whether these children were alive or dead. The number of pregnancy ranged from 1 to 16, with a median number of three pregnancies and a mean of 4.3 pregnancies. As shown in Figure 14 the number of pregnancies of women between 35 and 40 years extends from 2 to 16 pregnancies. As expected there is a relationship between the age of the women and the number of pregnancies, with younger women having fewer pregnancies compared to older women. With increasing age of the women the spread of the number of pregnancies rises. Figure 14 shows the situation of developing countries, where women having a much higher number of pregnancies in their lives than women in developed world. This situation is to a certain extent the result of limited resources of family planning and limited access to contraceptives of the women.

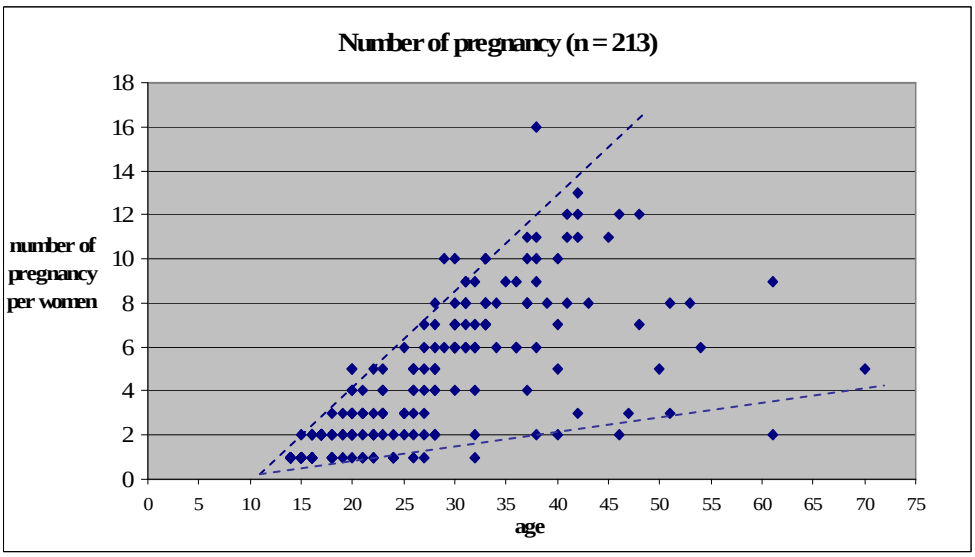


Figure 14:

Number of pregnancies related to the age of 213 women. With increasing maternal age the number of infants is also rising, however with elevating variance.

3.4.5. Vesico-vaginal-fistula operations and recto-vaginal- fistula operations

Age distribution of the operated women

There was the necessity of operation of 285 among all 323 patients. The age of operated women shows a similar distribution as the distribution of age of all treated women. The age of all operated women ranged from 14 to 70 years, with a median of 21 years and a mean of 24.7 years. Almost half of the operated women, 47.3%, were 20 years old or less.

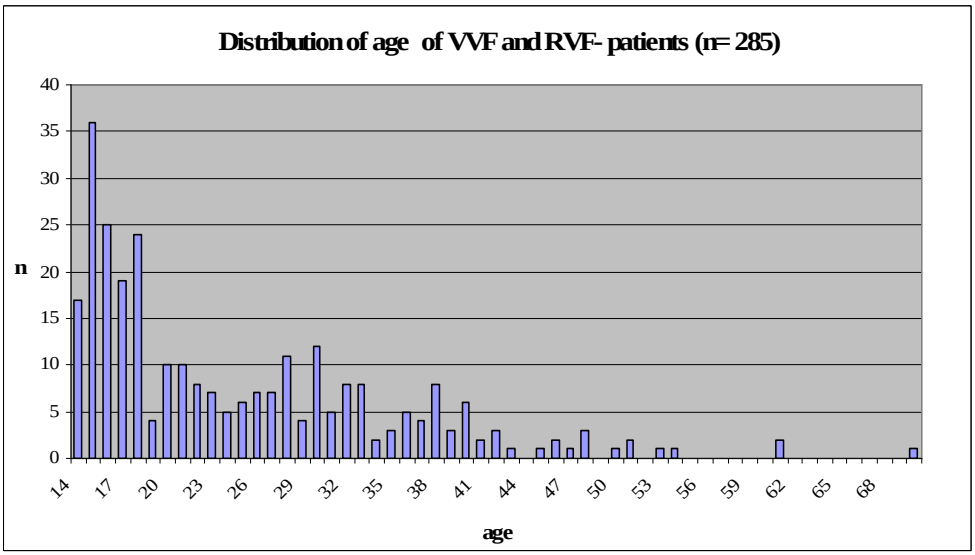


Figure 15:

Distribution of maternal age and incidence of operated patients; details of 285 patients.

Age distribution in relation to the type of operation (VVF/RVF)

Figure 16 shows the distribution of the type of operation of all 285 operated patients. The main part, 82.8% of the patients who needed an operation, suffered from a vesico-vaginal fistula; only 7.7% had a recto-vaginal fistula and 9.5% of the patient had both, a vesico-vaginal and recto-vaginal fistula.

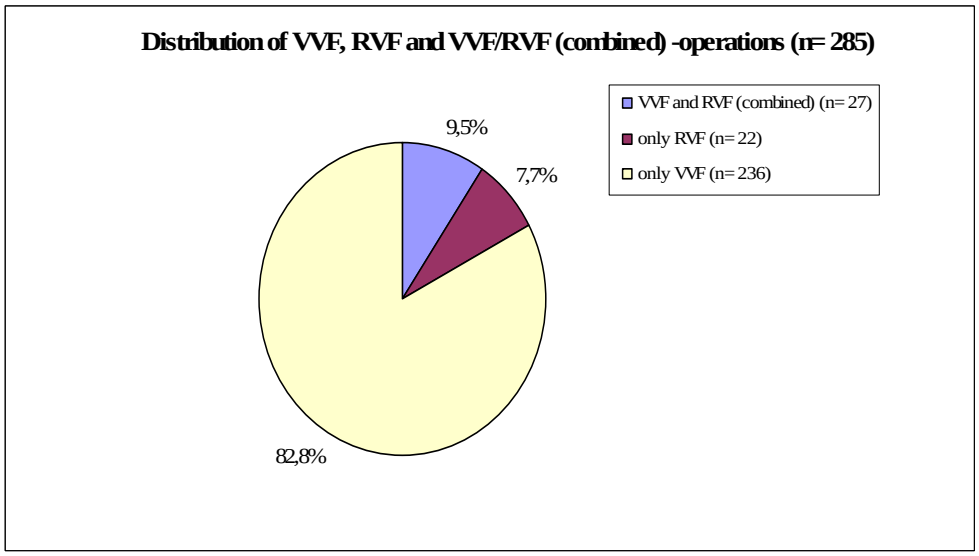


Figure 16:

Distribution of type of fistula (VVF, RVF and combined VVF/RVF); details of 285 patients.

The number of different types of operation: vesico-, recto-vaginal fistula or both; as well as the age of the women in relation to the type of operation are shown in figure 17. There is a distribution of the recto-vaginal fistula and patients, who suffered from vesico- and recto-vaginal fistula, in all classes of ages. The vesico-vaginal fistula is mainly a problem of younger women in developing countries and the frequency is dependent on the age of the patients by contrast to recto-vaginal fistulas.

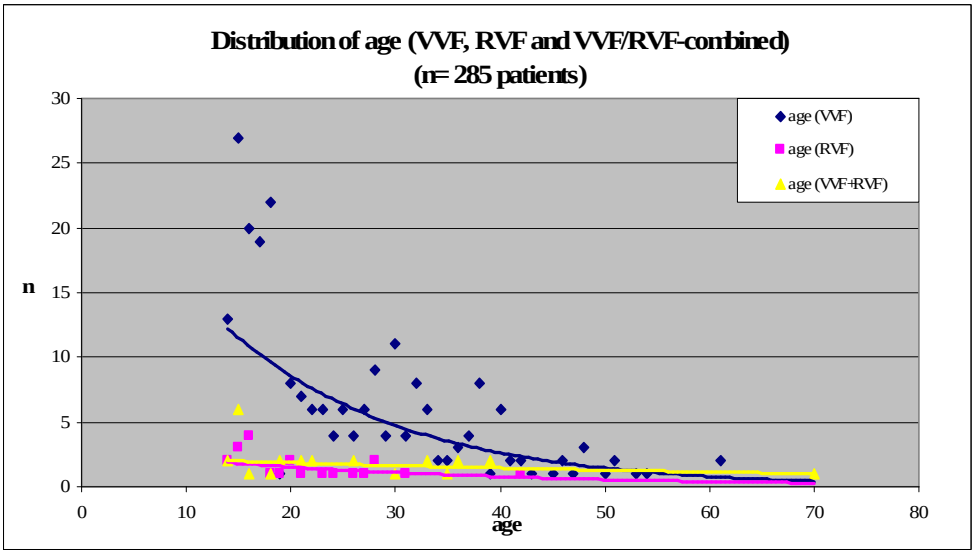


Figure 17:

Distribution of age of all patients with VVF, RVF and combined fistula, details of 285 patients.

It is striking that VVF is the most relevant fistula having its highest incidence below 20 years.

Recurrence - operations after VVF- operations

Figure 18 depicts the number of recurrence-operations under all vesico-vaginal fistula operations (n= 236). The operation of vesico-vaginal fistula had a success rate of 75.8% in first operation in the hospitals in Wudil and Zaria between October 2007 and July 2009. 13.6% of the patients needed a second operation, and even fewer patients, 10.6%, underwent a third or fourth operation.

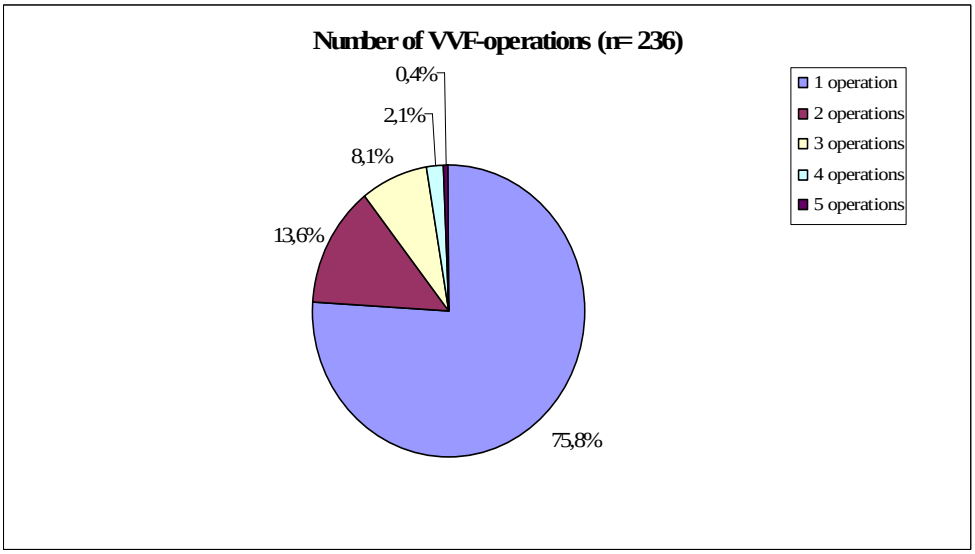


Figure 18:

Number of VVF-operations of 236 patients.

Recurrence - operations after RVF- operations

The operation of the recto-vaginal fistula had a higher success rate than operation of vesico-vaginal fistula. 22 patients among 285 operated women underwent a recto-vaginal fistula operation, 21 (95.5%) of them had a successful first operation, there was only one patient (4.5%) who needed a second operation afterwards.

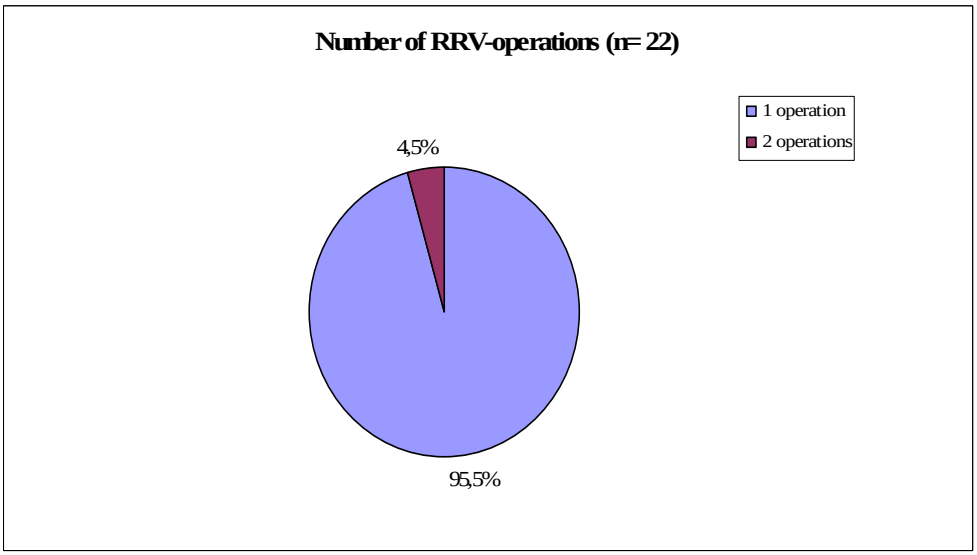


Figure 19:

Number of RVF-operations of 22 patients.

Frequency of VVF- and RVF-operations

There were 27 patients among 285 operated women who had a combined vesico-vaginal- and recto-vaginal fistula: 15 patients (55.6%) had no successful operation at first surgery, four patients (14.8%) needed a third and four patients (14.8%) a fourth operation. Altogether four patients (14.8%) needed more than four operations to get healed from the complicated fistula.

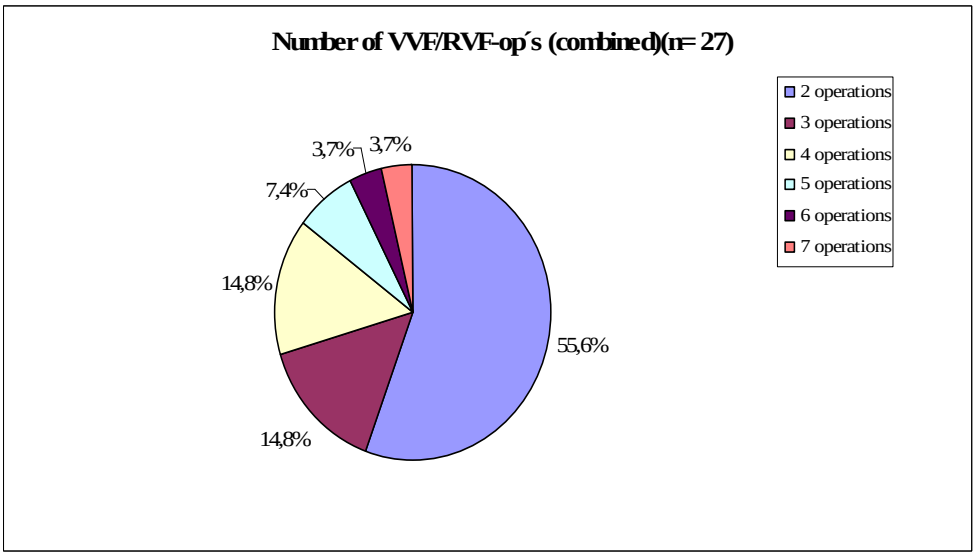


Figure 20:

Number of combined VVF- and RVF operations; details of 27 patients.

3.4.6. Distribution of nerve injuries ("drop foot")

Many women suffering from fistulas experience different types of nerve injuries as described in "Obstructed labor injury complex" (see chapter 3.3.2.), sometimes with the consequence of drop foot. Among 323 treated patients there were details of 136 patients about the dilemma of a drop foot. Fortunately approximately 50% of the women have a normal function in both legs without any restrictions. Nevertheless, there are many women with restriction in movement of the muscles from muscle weakness up to only a muscle twitch left in the legs or even no function anymore in one leg.

The grading of muscle power is measured by using the Medical Reasearch Council scale 0-5 whereby [21]:

grade 0 = no contraction, no function

grade 1 = flicker or trace of contraction

grade 2 = active movement, with gravity eliminated

grade 3 = active movement against gravity

grade 4 = active movement against gravity and resistance

grade 5 = normal power

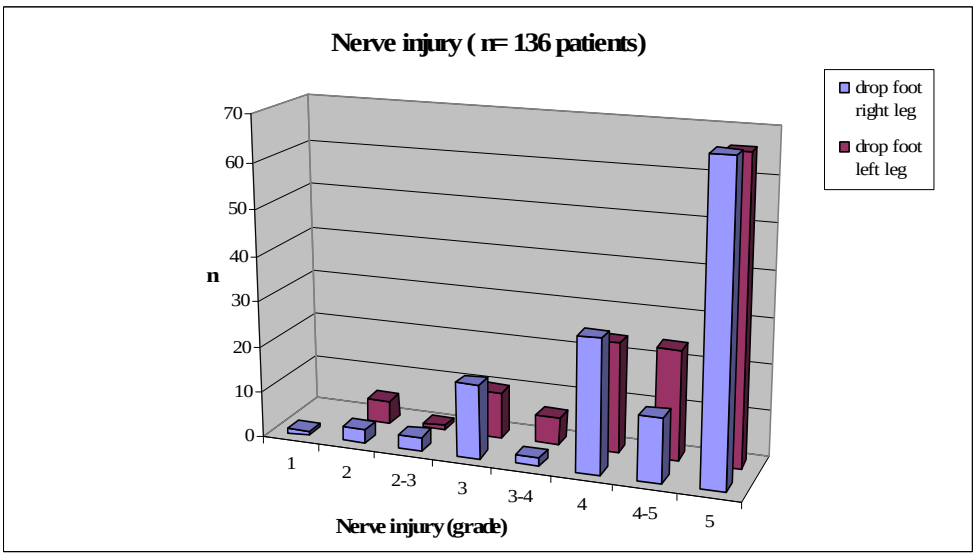


Figure 21:

Nerve injuries with drop foot; details of 136 patients.

3.4.7. Distribution of urethra lengths (EUO/B) and longitudinal diameter measured on the basis of urinary catheter

The longitudinal diameter, a measurement to estimate the bladder capacity, was calculated by measurement of the distance between the external urethra opening (EUO) and the bladder wall (BW), measured by a calibrated metal sound, minus the distance between the external urethra opening and the balloon (B) of the transurethral catheter (urethra lengths). The longitudinal diameter was measured in 301 patients. The calculated longitudinal diameter of the bladder (EUO/BW– EUO/B) ranged from 4 cm to 19 cm with a median of 10 cm. By measurement of the longitudinal diameter of the bladder, the bladder capacity can be estimated.

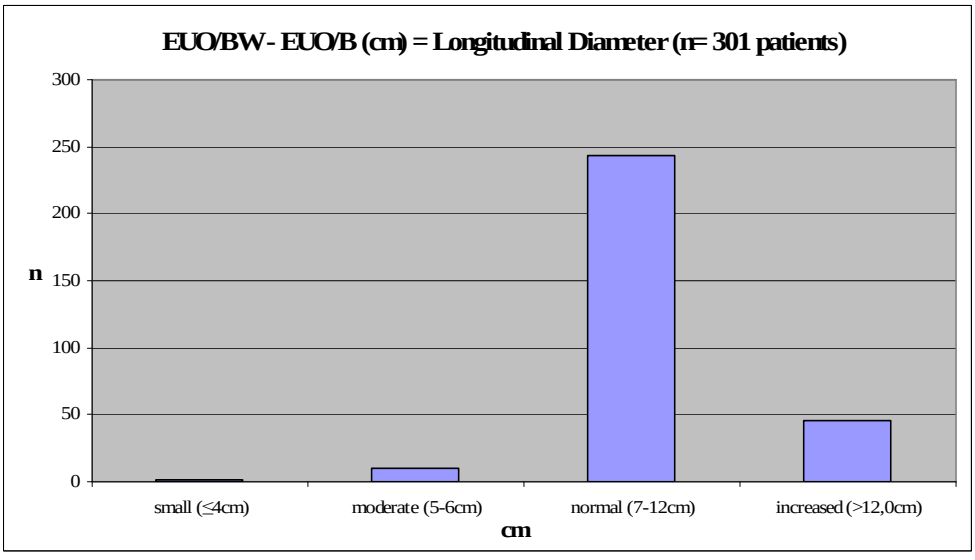


Figure 22:

Measurement of EUO/BW – EUO/B, the longitudinal diameter of the bladder (n= 301 patients).
The bladder capacity can be estimated by the longitudinal diameter:
Small ≤ 4 cm
Moderate 5-6 cm
Normal 7-12 cm
Increased > 12 cm

The urethra lengths could be collected in 301 patients by measurements of EUO/B. The urethra length (EUO/B) had a critical length of 1.5 cm or less in 105 patients (34.9%), which results most likely in a post-repair incontinence. All patients measured a small urethra with a maximum length of 4.1 cm, whereas the normal urethra lengths should be between 3 and 5 cm.

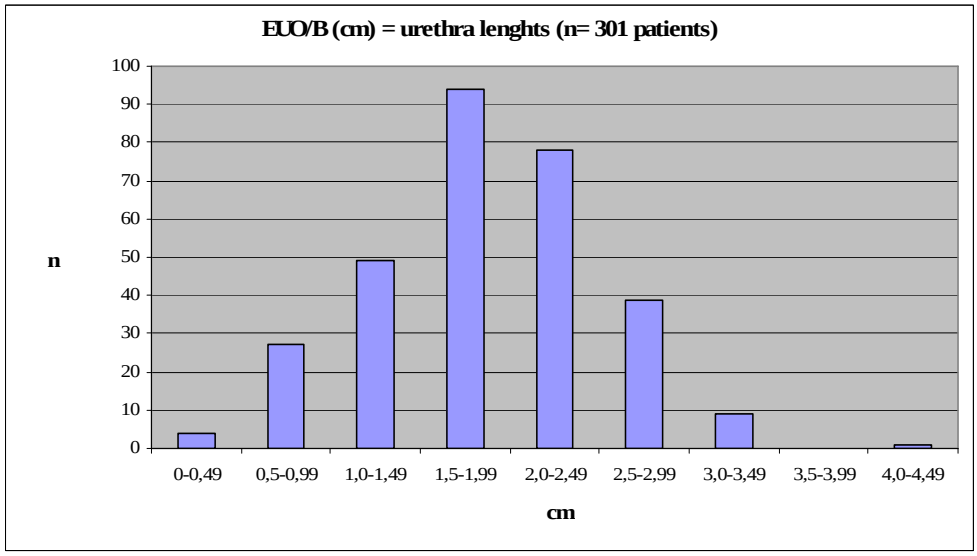


Figure 23:

Measurement of EUO/B (urethra lengths) of 301 patients.
105 patients (34.9%) had critical urethra lengths of 1.5 cm or less.

Figure 24: *Operation theatre in Kano State*

3.5. Discussion and conclusions

Obstetric fistulas are still a problem in the developing countries, although the reasons for development of obstetric fistula are well known. They could be prevented with early treatment during labor. Reasons for obstetric fistulas are the same reasons for high maternal and fetal mortality in developing countries. The three delays: the socio-economic factors, the transport of the patients to the hospital and the management of the hospitals, still need improvement to avoid both, maternal and fetal mortality and the formation of obstetric fistula. There is still the task to improve all three delays to avoid the development of fistula in future.

Beside all efforts to avoid the development of fistulas in the future, women who already suffer from fistulas need help in form of different treatment. As described in chapter "3.3.4. Methods of treatment" an immediate treatment, when a woman starts leaking urine, is necessary. Each woman should have an indwelling catheter regardless of the cause of leaking. This kind of treatment also can be carried out by smaller hospitals even under limited conditions. At least 15-20% of the fistulas are going to successfully treated within 4-6 weeks [6].

If there is no healing of the obstetric fistula by catheter therapy there is the necessity of an operation carried out by experienced fistula surgeons. The surgery of obstetric fistulas cannot be carried out in primary health care centers; a gynecologist specialist, who carries out the operation, as well as instruments and anesthesia are necessary for a sufficient care of the fistulas. Therefore the Fistula Centers in Wudil and Zaria are specialized in treatment of obstetric fistula. To continue the task of these centers, gynecologists must be trained regularly to treat and operate obstetric fistula. A standardized classification system for obstetric fistula is necessary for a standardization of the operation techniques. In the Fistula Centers in Wudil and Zaria in northern Nigeria Waaldijk´s classification system is used and taught to the fistula surgeons. All over the developing world different classification systems are used from different surgeons. There is an urgent need for a universally accepted classification system for fistulas.

The results of this study show, that mainly young women, almost half of them 20 years or younger, suffer from obstetric fistula. The early pregnancy in an age the pelvis is not fully grown and malnutrition are important problems in the developing world. In poor areas, where poverty, early marriage, low social status and low economic infrastructures are more common,

the problem of obstetric fistula arises. These are the areas where is no access to family planning and maternal health services, as follows the maternal and fetal mortality and morbidity is high [13]. As shown in the figure 13, more than half of the children of women, who suffer from obstetric fistula, died.

The treatment of fistula is an operation, which is curing the patients of the fistula in most cases by one operation. The success rate of vesico-vaginal fistula with the first operation was 76%; 90% of the patients were released of their fistula within the second operation (figure 18). Similar results could be reached in the operation of the recto-vaginal fistula, 96% of recto-vaginal fistula could healed successful by one operation (figure 19).

The combination of vesico-vaginal and recto-vaginal fistula is a more complicated situation, only a small number of patients (9%) suffer from this disease. The result shows a success rate in 56% after the first operation. Many patients needed two or even more operations until healing of the complicated fistula was achieved (figure 20). These results make understandable, why experienced fistula surgeons should carry out such operations, not only to get an exact classification of the fistula but also to treat the special type of fistula by application of the right method.

The measurement of the urethra lengths by a balloon catheter, the urethra lengths, the distance between external urethra opening and the balloon of the catheter (EUO/B) is an indicator of the occurrence of post repair incontinence. The measurement should be carried out before operation starts. The results show a critical urethra length of 1.5 cm or less in 35% of the patients (figure 23).

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4. Hospital Audit – Infrastructure, Capacity and Necessary Improvements of Nigerian Hospitals in Kano State and Kaduna State

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4. Hospital Audit – Infrastructure, Capacity and Necessary Improvements of Nigerian Hospitals in Kano State and Kaduna State

4.1. Methods of Audit

The project focused on investigation of the causes of the third delay and the aim of the study was to analyze the impact of equipment and hygienic conditions on maternal mortality.
The studies were conducted in ten hospitals in the north of Nigeria. All hospitals participated since January 2008 in quality assurance in hospital service by a monthly data collection. These hospitals, five hospitals in Kano State and five hospitals in Kaduna State in the north of Nigeria were visited in December 2009 and the available equipment checked and the hygienic conditions in the hospitals evaluated.

The number of doctors, midwives and nurses of each hospital have been categorized and related to the number of deliveries in year 2009. This gives a rough estimation of the work load of the employees in each hospital.
The hospitals were investigated of the general conditions including the water supply and the electricity conditions.

In the hospitals an assessment of the operating theatre, the delivery room, the neonatal unit, the obstetrical ward and the general conditions were carried out. The number of available equipment, the equipments conditions and the hygienic conditions were judged in each room of the maternity unit in the hospitals.

Five items in each hospital area: operating theatre, delivery room, neonatal unit, delivery ward/ antenatal clinic and general conditions - have been valued with a score from one (very good) to six (very bad) for the equipment and for the hygienic conditions. For each hospital a total score for these conditions has been related to the maternal mortality in each hospital.

4.2. Organization

4.2.1. Principles of quality assurance

Basic principles of quality assurance in a hospital are based on three parameters:

1. Quality of infrastructure
2. Quality of process
3. Quality of outcome.

All three parameters are interdependent and closely connected. ‘Quality of infrastructure’ comprises the condition of the hospital building: water supply, power supply, hygienic conditions, number of staff and the equipment available. The ‘quality of process’ is predominantly dependent on a sufficient infrastructure, but also on trained and well-attuned and experienced personnel and their professional performance. This can be achieved by a continuing evaluation of the results and by benchmarking. This will lead to a spiral of improvement of maternal and infant health care and quality of outcome [1].

Figure 25: *Hospital entrance of a hospital in Kaduna State*

4.2.2. Circle of continuous quality improvements (Quality circle)

In order to reach a steady improvement in the quality of the treatment of the patients, the current situation is analyzed regularly at each hospital. By collecting different data like maternal and fetal mortality, the rate of Caesarean section and the postpartum hemorrhage at the individual hospitals delivers an overview of the conditions at the ten hospitals. A competition can be created by comparing the results of the hospitals. These results and the reasons for the results are discussed to prepare new standards for the reduction of maternal mortality. Among other priority measures, the improvement in the equipment is part of introducing new standards in the maternity units of the hospitals. By improving this equipment, for example, new upgrade standards can be reached in the individual hospitals.
After that new data are regularly collected in order to analyze and discuss the improvement again. Through these repeated measures a steady improvement of the treatment for the patients shall be achieved in all the hospitals [1].

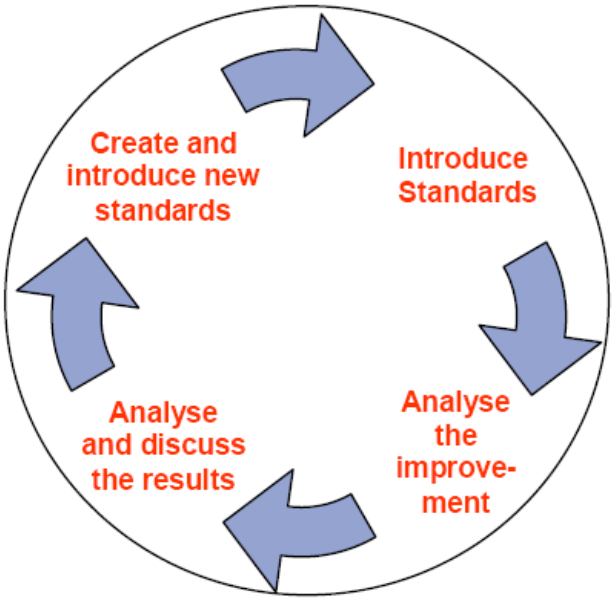


Figure 26:

Circle of continuous quality improvements. The Quality circle shows the creation and improvement of new standards in obstetrics by analysing and discussing the results in half-yearly „review-meetings“.

4.2.3. Hospitals participating in quality assurance in obstetrics

Ten hospitals, five from Kano State and five from Kaduna State decided to participate in the data collection in obstetrics. The ten secondary hospitals belonging to the north-east geopolitical zone in Nigeria, Aminu Kano Teaching Hospital in Kano and Ahmadu Bello University Teaching Hospital (ABUTH) in Zaria are tertiary institutions of the geopolitical zone [2, Appendix]. The maps show the location of the hospitals in both states. The following hospitals took part [1]:

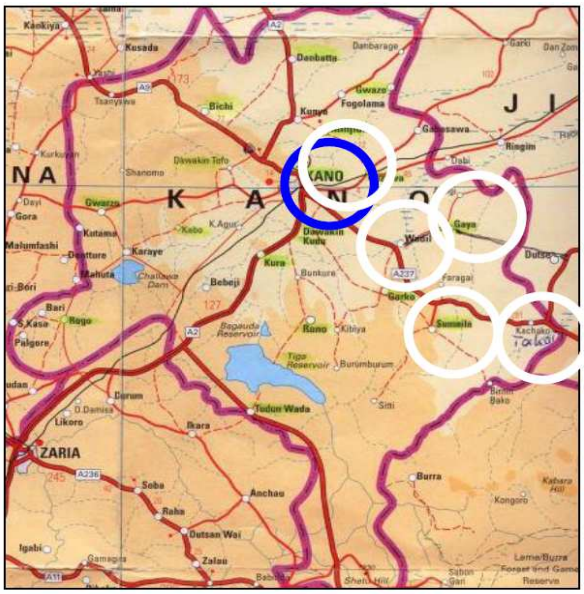


Figure 27 a: *Map of Kano State and location of the participating hospitals*

Kano State Hospitals:
Aminu Kano Teaching Hospital, Kano (AKTH),

General Hospital Sumaila,
General Hospital Gaya,
General Hospital Wudil,
General Hospital Takai,
General Hospital Sheik Muhammed Jidda, Kano

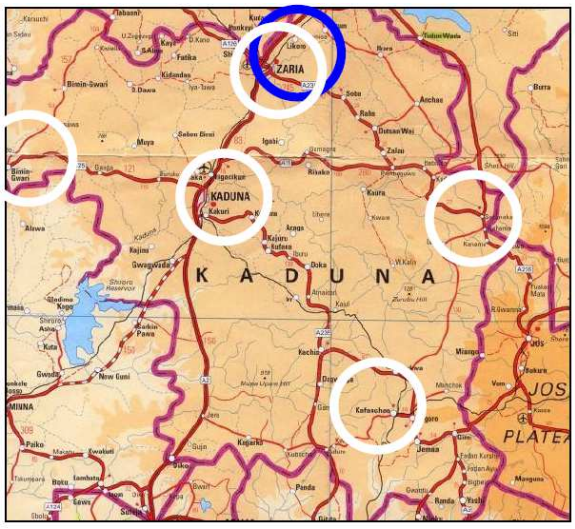


Figure 27b: *Map of Kaduna State and location of the participating hospitals*

Kaduna State Hospitals:
Ahmadu Bello University Teaching Hospital (ABUTH), Zaria,

Yusuf Dantsoho Memorial Hospital, Kaduna,
General Hospital Kafanchan,
General Hospital Birnin Gwari,
Hajiya Gambo Sawaba General Hospital Kofan Gaya, Zaria,
Alh. Mhd. Dabo Lere Memorial Hospital, Saminaka

4.3. Kano State Hospital Audit

4.3.1. Hospital reports of Kano State and photo documentation

Hospital No. 26, Kano State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	25,341	22,817
Deliveries:	1,608	1,818
Caesarian section:	49 (3.1%)	48 (2.6%)
Maternal mortality:	34 (2.1%)	29 (1.6%)
Fetal mortality:	87 (5.4%)	154 (8.5%)

General conditions:

The water supply as well as the electricity provision in the hospital is not in good condition. There is no generator available for the hospital lacking electrical supply at all times. Computers are not available in the entire hospital. A general laboratory exists and is in good condition, but there is no blood bank available around the hospital. The refrigerator, which is available at the delivery ward, is not in use for reasons unknown. Facility and hygiene conditions at the hospital are fair.

Staff:

There are one gynecologist and two general practitioners working in the hospital, who are responsible for the maternity unit as well as for all other units in the hospital. In addition, six midwives and two community health workers take care of the maternity unit. In 2008, approximately 25,300 patients were treated in the antenatal clinic, in 2009 about 22,800 patients. In total there were 1,608 deliveries in 2008 and 1,818 deliveries in 2009.

Delivery room:

The delivery room is equipped with four delivery beds. The room is supplied with two sets of delivery instruments, two sets of vacuum extractors and an episiotomy set. A curettage set is not in use. A baby scale is available, but does not work very precisely. For measuring the blood pressure of the women there is only one sphygmomanometer available, which is in use for the delivery room and the delivery ward. A fetal Doppler for the measurement of the fetal heart rate is available, but no fetal heart-rate monitor for continuous recording. There is a shortage of long gloves for the deliveries in the hospital. In the delivery room the facility conditions as well as the hygienic conditions are fair.

Delivery ward:

The delivery ward is combined with the eclamptic ward and there are a total of twelve beds for the women, each of it usually equipped with mosquito nets. At the time of the visit these nets were being cleaned. Next to the delivery ward there is also a VVF-ward (vesico-vaginal fistula) with seven beds. An infusion drip systems exist. The available scale for mothers does not work and a new one is required urgently. There is also a requirement for more sphygmomanometers, because there is only one available for the maternity unit. A maternity record book with detailed information about mother and child is kept on a regular basis. The delivery ward also has fair facility conditions as well as fair hygienic conditions.

Neonatal unit:

No neonatal unit is available at the hospital; there are neither incubators nor any instruments for intubation of the babies. The services for the neonates are therefore limited.

Ultrasound scanning room:

An ultrasound scanning room with a Mindray ultrasound scanning machine is available at the hospital. At the time of visit this room was locked and there was no possibility to get into the ultrasound scanning room. It is assumed that the ultrasound scanning machine is not available for all doctors and is not used regularly.

Operating theatre:

The operating theatre in the hospital is in use for all surgery in the maternity unit, also for the fistula surgery. One theatre nurse takes care of the operating theatre. It is equipped with two operating tables and theatre lamps, which are not working sufficiently and giving poor light. The existing anesthesia apparatus no longer works. There are no instruments for anesthesia available in the operating theatre, neither oxygen nor any Ambu bags. The theatre is provided with a sufficient number of instruments for surgery and also for conducting a Caesarean section. There is a small room available for cleaning the instruments, but with bad hygienic conditions. A sterilizer autoclaving machine for the instruments is in use. A suction machine is available and seems to be cleaned regularly. Anti-shock garment exists and is used in emergency cases at the hospital. The hygiene conditions and the facility conditions in the operating theatre are fair.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1.	General conditions:	Blood bank, electricity and water supply not very well
2.	Delivery room:	Forceps, curettage set, baby scale, fetal heart-rate monitor, long gloves for deliveries
3.	Delivery ward:	Adult scale, sphygmomanometer
4.	Neonatal unit:	Not working at all (incubator, instruments for intubation for the baby's)
5.	Ultrasound scanning room:	Not available, no access to ultrasound scanning machine
6.	Operating theatre:	Anesthesia apparatus, instruments for intubation, oxygen, Ambu bags

Hospital No. 26, Kano State – photo documentation

VVF-ward

Operating theatre

Suction machine

Anesthesia apparatus

Operating theatre

Operating theatre

Delivery ward

Delivery room

Suction machine

Hospital No. 25, Kano State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	9,701	9,036
Deliveries:	511	645
Caesarian section:	60 (11.7%)	26 (4.0%)
Maternal mortality:	11 (2.2%)	10 (1.6%)
Fetal mortality:	116 (22.7%)	81 (12.6%)

General conditions:

The hospital is supplied with a bore hole, but there is no pipe connection to the facilities. Electrical energy is available for five hours per day only, although there is a generator in use. Computers are not at disposal in the entire hospital. A laboratory with good conditions exists. Like the general conditions, the hygienic conditions in the hospital urgently need improvement.

Staff:

The hospital employs three general practitioners, who are responsible for the maternity unit as well as for all other units in the hospital.

Beside them, there are two midwives and six community health workers who are working in the maternity unit. About 9,700 patients were treated in the antenatal clinic in 2008 and approximately 9,000 in 2009. Altogether, 511 women gave birth to a child in 2008 and 645 in 2009.

Delivery room:

In the delivery room there are three delivery beds and a patient stretcher with foot rest. For deliveries there are three sets of instruments as well as forceps, vacuum extractors and specula available. Also a curettage set can be obtained. A new baby scale is available. For blood pressure measurement two sphygmomanometers are in use, which are for the delivery room and the delivery ward. Furthermore, a fetal Doppler is in use for measuring of the fetal heart rate. But as in all other hospitals, there is a need for fetal heart-rate monitors. In addition, there is a lack of long gloves for deliveries. There are poor hygienic conditions in the delivery room as well as poor equipment conditions.

Delivery ward:

At the delivery ward there are between 12 and 15 beds which all have mosquito nets. Hardly any infusion drip systems are available at the ward. A scale for measuring the weight of the mothers is in use. There are only two working sphygmomanometers for the entire maternity unit. A maternity record book with detailed information about mother and child is kept on a regular basis. The facility conditions at the delivery ward in the hospital are good, but dreadful hygienic conditions could be observed in the ward.

Neonatal unit:

As in many other hospitals there is no neonatal unit available at the hospital. Also incubators and instruments for intubation of the babies are not on hand.

Ultrasound scanning room:

A donated ultrasound scanning machine is supplied in the hospital, but has not been used for ultrasound diagnosis. Although an ultrasound scanning room and a patient stretcher are available, there is no possibility for ultrasound diagnosis in the hospital.

Operating theatre:

At the hospital one theatre nurse is responsible for the operating theatre. The theatre is equipped with an operating table and a theatre lamp. An anesthesia apparatus is not available, neither are instruments for intubations as well as oxygen are not on hand. Ambu bags are available, but are in poor condition and do not seem to be used. General anesthesia cannot be carried out because of these deficiencies and therefore the possibilities of treatments are limited. The theatre is provided with a sufficient number of instruments for surgery and two sets for Caesarean section. For sterilizing instruments an autoclaving machine is used in the operating theatre. There is an urgent requirement for a new suction machine since the one in the operating theatre is not working. One anti-shock garment for emergency situations is available in the hospital. The conditions of the equipment as well as the hygienic conditions are extremely bad in the operating theatre of the hospital.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1. General conditions: Blood bank, pipe-connection for water supply
2. Delivery room: Fetal heart-rate monitor, long gloves for deliveries
3. Delivery ward: Not available
4. Neonatal unit: Not working at all (incubator, instruments for intubation for the baby's)
5. Ultrasound scanning room: Not available
6. Operating theatre: Anesthesia apparatus, instruments for intubation, oxygen, Ambu bags, suction machine

Hospital No. 25, Kano State – photo documentation

Delivery ward

Delivery room

Baby scale

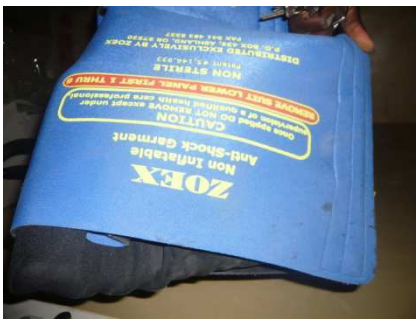
Delivery bed

Delivery room

Operating theatre

Operating theatre

Ambu bag



Anti-shock garment

Ultrasound machine, not in use, new

Hospital No. 24, Kano State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	6,106	9,098
Deliveries:	644	733
Caesarian section:	53 (8.2%)	33 (4.5%)
Maternal mortality:	38 (5.9%)	19 (2.6%)
Fetal mortality:	102 (15.8%)	122 (16.6%)

General conditions:

The water supply in the hospital is provided by a bore hole with hand pumps; there is no pipe connection to the facilities. Electrical energy is not available at all times, although there is a generator in use. There is no possibility of using computers in the entire hospital. A laboratory is available, but there is no blood bank around the hospital and therefore no possibility to obtain blood for the women in emergency cases. The hygienic conditions are fair, whereas bad facility conditions are observed in the hospital.

Staff:

There are two general practitioners working in the entire hospital. They are responsible for the maternity unit as well as for all other units in the hospital. The maternity unit is staffed with six midwives and three community health workers who take care of the patients. In 2008 approximately 6,100 women were treated in the antenatal clinic and around 9,100 in 2009. In 2008 there were 644 deliveries in the hospital; in 2009 733 women gave births in the hospital.

Delivery room:

The delivery room is equipped with four delivery beds and a patient stretcher with foot rest. No instruments for deliveries are available in the delivery room; there are neither specula nor vacuum extractors or forceps for deliveries. Neither episiotomy sets nor a curettage set are available. The services for births are therefore very restricted. For blood pressure measurement only one sphygmomanometer is on hand. This is used in the delivery room as well as at the delivery ward. There is neither a fetal Doppler nor any heart-rate monitor for continuous heart rate recording of the fetus obtainable in the hospital. The delivery room is supplied with a baby scale. Because there are no instruments for childbirth and thus the service is limited, the equipment conditions are assessed as very bad. The hygienic rating was also bad in the delivery room.

Delivery ward:

There are eight beds at the delivery ward, all equipped with a mosquito net. No infusion drip systems are available at the delivery ward. A maternity record book is kept regularly for delivery information. There is a shortage of sphygmomanometers at the ward, as only one is used for the delivery room and the delivery ward at the same time. The equipment conditions as well as the hygienic conditions are fair at the delivery ward.

Neonatal unit:

No neonatal unit is available at the hospital; there are neither incubators nor any instruments for intubation of the babies. The services for the neonates are limited as is the service for women in labor.

Ultrasound scanning room:

At the hospital there is an urgent requirement for an ultrasound scanning machine. They do not have any possibility for ultrasound diagnosis in the hospital for pregnant women.

Operating theatre:

There is one theatre nurse working in the operating theatre in the hospital. The theatre is equipped with one operating table and a working theatre lamp. Anesthesia equipment as well as instruments for intubation and oxygen are not available in the operating theatre. There are two sets for conducting a Caesarean section and some instruments for surgery, but there is still a need for more instruments in better conditions. An autoclaving machine for sterilizing these instruments is in use. A suction machine is available, but does not seem to be cleaned on a regular basis. As in many other hospitals there are no anti-shock garments in the hospital for emergency cases. One positively important point in the operating theatre is the window, properly seals the theatre from the outside. This is one of the reasons why the hygienic conditions in the operating theatre are assessed to be good. The facility conditions are poor, because urgently needed basic equipment is missing in the operation theatre.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1. General conditions: Blood bank, pipe-connection for water supply
2. Delivery room: Delivery instruments, specula, forceps, vacuum extractor, episiotomy set, curettage set, fetal Doppler, fetal heart-rate monitor
3. Delivery ward: Sphygmomanometer, drip systems, adult scale
4. Neonatal unit: Not working at all (incubator, instruments for intubation for the baby's)
5. Ultrasound scanning room: Ultrasound scanning machine
6. Operating theatre: Anti-shock garments, anesthesia apparatus, instruments for intubation, oxygen

Hospital No. 24, Kano State – photo documentation


Delivery ward



Maternity record book

Water tank

Eclamptic ward

Delivery room

Delivery beds

Delivery room

Baby scale

Operating theatre

Suction machine

Autoclaving machine

Hospital No. 23, Kano State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	26,508	16,292
Deliveries:	2,115	1,464
Caesarian section:	89 (4.2%)	35 (2.4%)
Maternal mortality:	11 (0.5%)	12 (0.8%)
Fetal mortality:	56 (2.7%)	120 (8.2%)

General conditions:

At the hospital the water supply is ensured by a bore hole with pipes to the facilities. Electrical energy is available and backed by a generator, which works continuously. There are no computers in the hospital. A standard laboratory is available, but there is no blood bank around the hospital for the treatment of severe bleedings. The facility conditions are good and there are fair hygiene conditions at the hospital.

Staff:

The hospital employs three obstetricians who are responsible for the maternity unit. Moreover, 14 midwives and nurses work in the maternity unit. In the antenatal clinic approximately 26,500 patients were treated in 2008, in 2009 around 16,300 patients. Altogether, 2,115 women in 2008 and 1,464 women in 2009 gave birth to a child.

Delivery room:

In the delivery room there are two delivery beds available, but no patient stretcher with foot rest is obtainable. There are two sets of delivery instruments and a suction machine for childbirth at disposal. In addition, there is one vacuum extractor, one episiotomy and curettage set in use and specula available. For blood pressure measurement only one sphygmomanometer is on hand which is used in the delivery room as well as at the delivery ward. Therefore there is a requirement for sphygmomanometers at the maternity unit in the hospital. A fetal Doppler is in use, but there is no fetal heart-rate monitor on hand in the delivery room. A working baby scale is accessible. There is a lack of long gloves. The facility conditions as well as the hygienic standards are fair in the delivery room.

Delivery ward:

At the delivery ward there are around 22 beds, which are for all gynecological and obstetrical patients. Mosquito nets are not available for each bed, but there are some in front of the windows of the ward. A few infusion drip systems are in use. A delivery book is updated regularly for recording information about mother and child. Only one sphygmomanometer is available, which is used in the delivery room and at the delivery ward. Scales for the mothers are not available. The hygienic conditions as well as the equipment conditions are fair.

Neonatal unit:

As in most other hospital there is no neonatal unit at the hospital. Instruments for intubation and incubators for the neonates are not available.

Ultrasound scanning room:

An ultrasound scanning room for diagnostic procedures is available in the hospital. The room is equipped with a Mindray ultrasound scanning machine. At the time of visit this room was locked and there was no possibility to see the ultrasound scanning machine. It is assumed that the ultrasound scanning machine is not available for all doctors and is not used regularly.

Operating theatre:

There are six nurses responsible for the operating theatre of the hospital. One operating table and a theatre lamp are available for operations. An anesthesia apparatus is in use and oxygen and Ambu bags are available, but no resuscitation equipment or instruments for intubation are accessible. Therefore, general anesthesia cannot be carried out. For conducting Caesarean sections two sets of instruments are available, but there is a need for more instruments for other surgery. An autoclaving machine is in use for sterilizing the instruments. The theatre has a suction machine. Anti-shock garments for the treatment of severe bleedings are not available in the entire hospital. In the operating theatre very good hygienic conditions and equipment conditions could be observed.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1. General conditions: Blood bank
2. Delivery room: Forceps, fetal heart-rate monitor, long gloves for deliveries
3. Delivery ward: Sphygmomanometer, adult scale
4. Neonatal unit: Not working at all (incubator, instruments for intubation for the baby's)
5. Ultrasound scanning room: Not available
6. Operating theatre: Anti-shock garments, instruments for intubation

Hospital No. 23, Kano State – photo documentation

Delivery ward

Maternity record book

Baby scale

Delivery room

Delivery beds

Suction machine

Operating theatre

Suction machine

Autoclaving machine

Ambu bags

Hospital No. 22, Kano State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	8,352	9,872
Deliveries:	1,538	1,903
Caesarian section:	43 (2.8%)	64 (3.4%)
Maternal mortality:	41 (2.7%)	31 (1.6%)
Fetal mortality:	155 (10.1%)	134 (7.0%)

General conditions:

The water supply at the hospital provided by a water tank only, there are no pipes to the facilities and the water must be taken to the facilities in buckets. Electrical energy is available, but the generators only work for approximately twelve hours per day. A laboratory is available and in good condition, but there is no blood bank around the hospital. The hygienic conditions are fair at the hospital; the equipment conditions all over the hospital are poor.

Staff:

Two general practitioners work in the entire hospital. They are responsible for the maternity unit as well as for all other units in the hospital. The maternity unit is staffed with three midwives and two community health workers. About 8,400 patients were treated in the antenatal clinic in 2008, approximately 9,900 patients in 2009. In 2008 1,538 women gave birth to a child, in 2009 there were 1,903 deliveries in the hospital.

Delivery room:

The delivery room is equipped with three delivery beds and a patient stretcher with foot rest. For deliveries there are two sets of instruments in use. Specula are available in the delivery room, but there are no forceps and no vacuum extractors for deliveries. An episiotomy set is on hand, but there is no curettage set available. For the maternity unit only one sphygmomanometer is in use. A fetal Doppler is available. There is a lack of gel for the fetal Doppler; a fetal heart-rate monitor is not accessible. The baby scale in the delivery room is not working, but there is a new one in the storeroom, which has been in use since the day of visit. There is a lack of long gloves for deliveries. The equipment conditions in the delivery room are fair and poor hygienic conditions were observed at the time of visit.

Delivery ward:

At the delivery ward there are nine beds; mosquito nets are in front of the windows only. Infusion drip systems are not on hand at the delivery ward. A maternity record book for delivery information is kept regularly. There is a lack of sphygmomanometers, as only one sphygmomanometer is accessible for the delivery room and the delivery ward. There are no scales available for the mothers. The equipment conditions as well as the hygienic conditions are fair at the delivery ward.

Neonatal unit:

No neonatal unit is available at the hospital; there are neither incubators nor any instruments for intubation of the babies. The services for the neonates are therefore limited.

Ultrasound scanning room:

No ultrasound scanning machine is available at the hospital and the possibilities of antenatal care are restricted.

Operating theatre:

At the hospital one theatre nurse is responsible for the operating theatre. One theatre table with a working theatre lamp is available. There is an urgent requirement for a new anesthesia apparatus, since the present one is currently out of order. In addition, there are neither instruments for intubation nor any Ambu bags or oxygen. Therefore general anesthesia cannot be carried out in the operating theatre. For surgery there is a sufficient number of instruments available and two sets for conducting a Caesarean section are on hand. For sterilizing the instruments an autoclaving machine is in use in the operating theatre. A suction machine is used for surgery and seems to be cleaned regularly. As in most hospitals anti-shock garments are not obtainable. Because there is a lack of certain basic equipment for surgery, the overall condition of the equipment was reviewed as bad. Moreover, the hygienic conditions are not good in the operating theatre either.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1.	General conditions:	Blood bank, pipe connection to maternity unit for water supply
2.	Delivery room:	Forceps, vacuum extractors, curettage set fetal heart-rate monitor
3.	Delivery ward:	Sphygmomanometer, adult scale, drip systems
4.	Neonatal unit:	Not working at all (incubator, instruments for intubation for the baby's)
5.	Ultrasound scanning room:	Ultrasound scanning machine
6.	Operating theatre:	Anti-shock garments, anesthesia apparatus, instruments for intubation, oxygen, Ambu bags

Hospital No. 22, Kano State – photo documentation

Water tank

Delivery room

Delivery bed

Suction machine

Operating theatre

Anesthesia apparatus

Suction machine

Delivery ward

4.3.2. Synopsis of health care in obstetrics in Kano State

	Hospital No. 22	**Hospital No. 23**	**Hospital No. 24**	**Hospital No. 25**	**Hospital No. 26**
Staff					
Consultants OB/GYN	0	0	0	0	0
Doctors OB/GYN	2 GP´s	3 OB/GYN	2GP´s	3 GP´s	1 OB/GYN + 2 GP´s
Midwives/Nurses	3	14	6	2	6
CHEWS	2	0	3	6	2
Record officer	yes	yes	yes	yes	yes
Operating theatre					
Theatre nurses	1	2	1	1	1
Anesthesia Apparatus	0	1	0	0	0
Operating table	1	1	1	1	2
Instruments for operations	sufficient	sufficient	sufficient	sufficient	sufficient
Instruments for Intubation (mothers)	0	0	0	0	0
Oxygen availability	no	yes	no	no	no
Suction machine	1	1	1	0	1
Ambu bags	0	yes	yes	yes	0
Resuscitating equipment	0	0	0	0	0
Anti-shock garments	0	0	0	1	1
Set for Caesarean section	2	2	2	2	sufficient
Autoclave	1	1	1	1	1
Theatre lamp	yes	yes	yes	yes	yes, bad light
Head light + battery charger				1	
OP functional	yes	yes	yes	yes	yes
Postpartum room	yes	no	no	no	no
Hygienic conditions*	5	2	3	5	4
Equipment conditions*	5	2	4-5	5	4

	Hospital No. 22	**Hospital No. 23**	**Hospital No. 24**	**Hospital No. 25**	**Hospital No. 26**
Delivery room					
Delivery beds	3	2	4	3	4
Delivery instruments	2	2	0	3	2
Specula	yes	yes	0	Yes	yes
Forceps	0	0	0	Yes	0
Vacuum extractor set	0	1	0	1	2
Episiotomy set	1	1	0	1	1
Delivery set	2	2	0	3	1
Curettage set	0	1	0	1	0
Sphygmomanometer	1	1	1	2	1
Fetal Doppler (only HR)	1, no gel	1	0	1	1
Fetal heart-rate monitor	no	no	no	No	no
Ultrasound scanning machine	no	yes, room locked	no	yes, new, not in use	yes, room locked
Patient stretch + foot rest	1	0	1	1	0
Long gloves	yes	no	yes	No	yes, not enough
Baby scale	1	1	1	1	1, not working well
Hygienic conditions*	5	4	5	5-6	4
Equipment conditions*	4	4	6	5	4
Neonatal unit	no	no	no	No	No
Incubator	0	0	0	0	0
Instruments for Intubation (babies)	0	0	0	0	0
Hygienic conditions*	6	6	6	6	6
Equipment conditions*	6	6	6	6	6

	Hospital No. 22	**Hospital No. 23**	**Hospital No. 24**	**Hospital No. 25**	**Hospital No. 26**
Obstetrical ward/ ANC					
Number of beds	9	22	12, 8 in use	12-15	12
Drip stands	no	yes	No	yes	Yes
Mosquito nets	yes	yes, in front of windows	Yes	yes	in cleaning
Scanning room (ultrasound)	no	yes	No	yes	Yes
Mother scales	0	0	1	1	0
Hygienic conditions*	4	4	4	5	4
Equipment conditions*	4	4	4	3	4
VVF Surgery	no	no	No	no	7 beds
General conditions					
Water supply – Bore hole	water tank, no pipes	yes, with pipes	bore hole with hand pump	bore hole with hand pump	dirty water
Electricity	good	good	some h/d	5 h/d	not good
Windows (properly fitted and sealed)	not good, good in operation theatre	not good, good in operation theatre	No	no	No
Generator	yes	yes	Yes	yes	Yes
Refrigerator	yes	yes	Yes	yes	yes, not in use
Computer	no	no	No	no	No
Mg- Sulphate	yes	yes	Yes	yes	Yes
Blood bank available	no	no	No	no	No
Hygienic conditions (overall)*	4	3-4	4	4-5	4
Equipment conditions*	4-5	3	4-5	4-5	4

	Hospital No. 22	**Hospital No. 23**	**Hospital No. 24**	**Hospital No. 25**	**Hospital No. 26**
Laboratory	yes	yes	yes	Yes	Yes
Hygienic conditions*					
Equipment conditions*	good conditions	standard lab	ok	good conditions	good conditions
Report 2009					
Delivery record book	yes	yes	yes	Yes	Yes
Number of deliveries	1,903	1,464	733	645	1,818
Caesarean section	64 (3.36%)	35 (2.39%)	33 (4.50%)	26 (4.03%)	48 (2.64%)
Eclampsia	243 (12.77%)	145 (9.9%)	199 (27.15%)	200 (31.01%)	282 (15.51%)
Postpartum Hemorrhage (PPH)	66 (3.47%)	27 (1.84%)	91 (12.41%)	93 (14.42%)	60 (3.3%)
Maternal deaths	31 (1.63%)	12 (0.82%)	19 (2.59%)	10 (1.55%)	29 (1.60%)
Fetal deaths	134 (7.04%)	120 (8.20%)	122 (16.64%)	81 (12.56%)	154 (8.47%)
Grand Total Rating					
Hygienic conditions (5-30)*	24	19,5	22	26	22
Equipment conditions (5-30)*	23,5	19	25	23,5	22

* For the evaluation the “Score criteria for general status” and “Score criteria for hygiene condition” have been used. The

1. Operating theatre
2. Delivery room
3. Neonatal unit
4. Delivery ward/Antenatal clinic
5. General conditions

have each been rated from one (excellent) to six (very poor). The total score according to the points given for each subdivision ranged from minimum five points to maximum thirty points for general status and from five to thirty points for hygiene condition, in total from ten to sixty.

4. 4. Kaduna State Hospital Audit

4.4.1. Hospital reports of Kaduna State and photo documentation

Hospital No. 16, Kaduna State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	21,649	24,290
Deliveries:	2,597	2,720
Caesarian section:	208 (8%)	156 (5.7%)
Maternal mortality:	15 (0.6%)	14 (0.5%)
Fetal mortality:	191 (7.4%)	214 (7.9%)

General conditions:

The water supply in the hospital is safeguarded by a bore hole and pipes to the facilities. The electrical supply is guaranteed and protected by a generator. Computers are not available with the exception of the administration. A laboratory exists and is in good condition. Like the general conditions, very good hygienic conditions have been established, too.

Staff:

There are four general practitioners at the hospital who are responsible for all facilities in the hospitals, i.e. also for the maternity unit. In addition, the maternity unit is staffed with four midwives. Approximately 21,600 patients were treated in 2008 in the antenatal clinic and approximately 24,300 patients in 2009. Altogether, 2,597 women gave births in 2008 and 2,720 in 2009.

Delivery room:

In the delivery room there are two delivery beds in the maternity unit of the hospital, a patient stretcher with foot rest is, however, not obtainable in the unit. There are vacuum extractors, forceps, three sets of delivery instruments, an episiotomy set for deliveries and a curettage set available, although the sets does not seem to be used. Furthermore a baby scale is on supply. Three sphygmomanometers are available for blood pressure measurement and a fetal Doppler for the measurement of the heart rate is in use. There is a need for fetal heart-rate monitors like in the other hospitals and a lack of long gloves. The facility conditions are very good and excellent hygienic conditions could be observed.

Delivery ward:

There are six beds with mosquito nets in the delivery ward, infusion systems are used at the ward. One mother scale is available at the delivery ward. A delivery register (maternity record book) with detailed information about mother and child is kept on a regular basis. The delivery ward has good facility conditions and very good hygienic conditions.

Neonatal unit:

A neonatal unit includes an incubator and three sets of instruments for intubation, there are very good hygienic conditions and the facility conditions are also good.

Ultrasound scanning room:

An ultrasound scanning room with a Mindray ultrasonic scanning machine is well equipped and is used regularly.

Operating theatre:

Seven theatre nurses work in the operating theatre. It is equipped with two operating tables and theatre lamps which work well. An anesthesia apparatus as well as instruments for intubation for the mothers including one laryngoscope, several tubes, Ambu bag and oxygen are available. For Caesarian sections there are two operation sets available and the operating theatre includes a functioning suction machine. Anti-shock garments are, however, not present, although the theatre nurses were trained in using them. There exist a monopolization of Pathfinder International for training and distribution, a not acceptable condition. For sterilizing the instruments an autoclave is used. The facilities are in an excellent hygienic condition, partially because of using glass bricks instead of open windows. These closed glass brick windows keep the dust out of the operating theatre and the equipment as well as other items in the operating theatre clean. A prominent negative aspect in the operating theatre is the condition of the floor because it absorbs fluids, e.g. blood and body liquids, and makes it difficult to keep high-standard hygienic conditions. The general settings were nevertheless classified as very good.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1. General conditions: Blood bank
2. Delivery room: Fetal heart-rate monitor, long gloves for deliveries
3. Delivery ward: Adult scale
4. Neonatal unit: Not available
5. Ultrasound scanning room: Not available
6. Operating theatre: Anti-shock garments,
   renovation of the floor urgently required

Hospital No. 16, Kaduna State – photo documentation

Delivery ward

Delivery room

Delivery room

Paul Walter scanning room

Ultrasound machine Mindray

Delivery room

Operating theatre

Suction machine

Operating theatre

Anesthesia apparatus

Operating theatre

Hospital No. 15, Kaduna State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	10,712	18,510
Deliveries:	972	1,134
Caesarian section:	120 (12.4%)	131 (11.6%)
Maternal mortality:	22 (2.3%)	22 (1.9%)
Fetal mortality:	147 (15.1%)	201 (17.7%)

General conditions:

The water supply in the hospital is good but electrical power is not available at all times, although there is a generator in use. Three Computers are at the disposal in the office. There is a well-equipped laboratory available, but no blood bank around the hospital. The general conditions as well as the hygienic conditions throughout the hospital are good.

Staff:

Five general practitioners work at the hospital and are responsible for the maternity unit as well as for all other units in the hospital. In addition, eight midwives take care of the patients in the maternity unit. About 10,700 patients were treated in the antenatal clinic of the hospital in 2008 and approximately 18,500 in 2009. In total there were 972 deliveries in 2008 and 1,134 in 2009.

Delivery room:

In the delivery room there are three beds for deliveries available and one patient stretcher with foot rest. There are two sets of delivery instruments for childbirth on hand. In addition, there is one vacuum extractor, an episiotomy and curettage set in use, specula are available. For blood pressure measurement only one sphygmomanometer is on hand, which is used in the delivery room as well as at the delivery ward. There is neither a fetal Doppler, nor any heart-rate monitor for continuous heart rate recording of the fetus. Since the available baby scale is not working, there is an urgent requirement for a new baby scale. As in most other hospitals there is a lack of long gloves for deliveries in the hospital. The general conditions need improvement as well as hygienic conditions observed in the delivery room.

Delivery ward:

At the hospital there are 14 obstetrical beds, usually each of it equipped with mosquito nets. At the time of visit these nets being cleaned. There are no infusion drip systems available at the delivery ward. The scales for the mothers at the delivery ward are not functioning and there is only one sphygmomanometer in maternity unit, which is used in the delivery room as well as at the delivery ward. Two maternity record books are kept for delivery information, which can lead to wrong recordings and incomplete documentation. The conditions regarding the equipment are fair; the hygienic conditions at the delivery ward are good.

Neonatal unit:

A neonatal unit is not available at the hospital; there are neither incubators, nor any instruments for intubation of the babies.

Ultrasound scanning room:

In the hospital an ultrasound scanning room with a Siemens ultrasound scanning machine exists. The ultrasound scanning machine seems to be used on a regular basis.

Operating theatre:

At the hospital two theatre nurses are responsible for the operating theatre. It contains one operating table; the theatre lamp in the theatre is not working. There is neither an anesthesia apparatus, nor instruments for intubation, or any oxygen available in the operating theatre. Ambu bags are not in use. Three sets of instruments for operation as well as two sets for conducting a Caesarean section are available. An autoclave for sterilizing the instruments is in use. A suction machine is available and seems to be cleaned regularly. As in many other hospitals there is an urgent requirement for anti-shock garments. Without these devices there is a restricted ability to act in emergency situations. The equipment conditions as well as the hygienic conditions in the operating theatre are fair.

Necessary improvements:

At hospital there are some items which are urgently needed:

1. General conditions: Blood bank, Generator
2. Delivery room: Forceps, fetal heart-rate monitor, fetal Doppler, baby scale, long gloves for deliveries
3. Delivery ward: Sphygmomanometer, adult scale, drip systems
4. Neonatal unit: Not working at all (incubator, instruments for intubation for the baby's)
5. Ultrasound scanning room: Not available
6. Operating theatre: Anti-shock garments, anesthesia apparatus, instruments for intubation, oxygen, Ambu bags, theatre lamp

Hospital No. 15 – photo documentation

Maternity record book

Delivery room

Baby scale

Delivery ward

Antenatal clinic

Contraceptive consulting room

Recovery room

Operating theatre

Autoclaving machine

Ultrasound machine Siemens

Hospital No. 14, Kaduna State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	9,992	10,082
Deliveries:	1,362	1,897
Caesarian section:	110 (8.1%)	134 (7.1%)
Maternal mortality:	37 (2.7%)	22 (1.2%)
Fetal mortality:	181 (13.3%)	153 (8.1%)

General conditions:

The hospital is supplied by means of water tanks, but there are no pipes to the facilities with exception to the operating theatre. Although a generator as well as solar light is in use, power supply is guaranteed for a few hours a day, there is light all the time due to a solar system. Computers are not available with the exception of one computer at the administration office. A laboratory exists; there is no blood bank within reach of the hospital, but a solar driven refrigerator. There are fair hygienic conditions, but very good general conditions throughout the hospital.

Staff:

Eleven general practitioners work at the hospital. They are responsible for the maternity unit as well as for all other units in the hospital. In addition, the maternity ward is staffed with nine midwives; three of them work in the antenatal clinic. About 10,000 patients were treated in the antenatal clinic in 2008 and about 10,000 patients in 2009. In total, 1,362 women gave birth to a child in 2008 and 1,897 women in 2009.

Delivery room:

In the delivery room there are four delivery beds and on patient stretcher with foot rest in the maternity ward of the hospital available. There is a sufficient supply of sets of delivery instruments, a vacuum extractor and forceps as well as specula are available in the delivery room. Three episiotomy sets and one set for conducting curettages are in use. There are two sphygmomanometers on hand for measuring blood pressure, which are used in the delivery room as well as at the delivery ward. For measuring the heart rate of the fetus a fetal Doppler is available, but no heart-rate monitor for continuous heart rate recording is on hand. A baby scale is available, but in a bad condition. In the delivery room of the hospital the facility conditions were observed to be very bad. Some prominent negative aspects are the bad condition of the equipment, like the delivery beds with dirty curtains between the beds, a bad structural condition of the buildings with an uneven floor in the delivery ward and windows which are not properly sealed. Therefore dust cannot be kept outside the buildings and it is

thus almost impossible to keep good hygienic conditions inside the facilities. There is no possibility for a sufficient sterilizing of the instruments in the delivery room apart from buckets with different chemical fluids for sterilization. There are fair hygienic conditions in the delivery room.

Delivery ward:

The delivery ward is equipped with twelve beds and three beds for eclamptic patients in a separate eclamptic room; some infusion drip systems are available. Usually each bed has a mosquito net. However, these nets were in cleaning at the time of the visit. A scale for the mothers is available at the ward, but it is in a bad condition and does not seem to be used regularly. For delivery information three maternity record books are kept, which can lead to an incomplete documentation because of irregular recording of the delivery information. The conditions regarding the equipment as well as the hygienic conditions are fair.

Neonatal unit:

There is no neonatal unit available at the hospital and there are neither incubators nor any instruments for intubation of the babies on hand. Thus, the services for the babies are limited.

Ultrasound scanning room:

A scanning room for ultrasound diagnosis is available; one doctor uses the Logic 9 scanning machine once a week. In December 2009 the hospital received from Rotary International a portable Siemens Acuson P10 ultrasound scanning machine. The use of the new ultrasound scanning machine was explained to a midwife by Dr. Neuner (RC Linz, Rotary International Austria).

Operating theatre:

Four theatre nurses are working in the operating theatre. It contains three operating tables and a working theatre lamp. The existing anesthesia apparatus is, however, not in use. Instruments for intubation of the patients are not available, neither is oxygen. There are a few Ambu bags which are in bad condition. The operating theatre is provided with a sufficient number of sets for surgery and three sets for Caesarean section. A sterilizer autoclaving machine for sterilizing the instruments is in use. As in many other hospitals there are no anti-shock garments for emergency cases. The operating theatre is directly connected to the water tank and there are two taps available to get water. It has been equipped to fulfill the prerequisite of a Fistula Centre of Kaduna State. The general settings are fair; the hygienic conditions are good in the operating theatre.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1.	General conditions:	Blood bank Generator (available for the VVF-ward only)
2.	Delivery room:	Fetal heart-rate monitor, baby scale, renovation of the floor urgently required
3.	Delivery ward:	Adult scale
4.	Neonatal unit:	Not working at all (incubator, instruments for intubation for the baby's)
5.	Ultrasound scanning room:	Not available
6.	Operating theatre:	Anti-shock garments, anesthesia apparatus instruments for intubation, oxygen, Ambu bags

Hospital No. 14, Kaduna State – photo documentation

Delivery ward

Delivery record books

Solar energy

Delivery room

floor (delivery room)

Baby scale

Delivery room

Ultrasound machine

Operating theatre

Ambu Bags

Incubator (not working)

Water tank and solar energy

Hospital No. 13, Kaduna State

Report:	**2008**	**2009**
Patients treated antenatal clinic:	10,143	7,680
Deliveries:	1,951	2,298
Caesarian section:	162 (8.3%)	155 (6.7%)
Maternal mortality:	16 (0.8%)	8 (0.4%)
Fetal mortality:	123(6.3%)	119 (5.2%)

General conditions:

The water supply of the hospital is guaranteed and protected by pipes to the facilities. The electricity is safeguarded by a generator. Computers are in use at the office of the hospital. A well-equipped laboratory is available. The facility conditions as well as the hygiene conditions at the hospital are very good.

Staff:

There are three general practitioners employed in the hospital, one constantly assigned to the obstetric department. One gynecological and one pediatric consultant work in the hospital. Altogether, there are 134 nurses in the entire hospital, 13 midwives and nurses of whom work in the maternity unit. In the antenatal clinic approximately 10,100 women were treated in 2008 and approximately 7,700 in 2009. In total, 1,951 women in 2008 and 2,298 women in 2009 gave birth to a child.

Delivery room:

In the delivery room two delivery beds and one patient stretcher with foot rest are available. There are five sets of delivery instruments for childbirth. A vacuum extractor and an episiotomy set are accessible as well, but there is no curettage set in the delivery room. A fetal Doppler for measuring the fetal heart rate is available, but no fetal heart-rate monitor for continuous recording. One sphygmomanometer is on hand for blood pressure measurement. One baby scale is available, too. There is a lack of long gloves for deliveries. The general conditions in the delivery room are good; the hygiene was assessed to be very good.

Delivery ward:

At the delivery ward there are seven beds and eight beds at the obstetrical ward. Some infusion drip systems and mosquito nets are available. The delivery room is equipped with one adult scale. There is only one sphygmomanometer in use for the delivery room and delivery ward. A maternity record book is kept regularly for delivery information. In the delivery ward general conditions are good and very good hygiene conditions could be observed.

Neonatal unit:

No neonatal unit is available at the hospital. There is one incubator at the delivery ward, which is not functioning because it has no oxygen and light. Instruments for intubation of the babies are also missing.

Ultrasound scanning room:

There is an ultrasound room with a working Toshiba ultrasound scanning machine. This room is not located near at the neonatal unit and does not seem to be in use on a regular basis.

Operating theatre:

At the hospital two theatre nurses are responsible for the operating theatre. It contains one operating table and a working theatre lamp. There is no anesthesia apparatus and no instruments for intubation. Oxygen is not available. Some Ambu bags are supplied and two sets of instruments for surgery as well as two sets for Caesarean section are available. An autoclave for sterilizing the instruments is in use. A suction machine is used, but does not seem to be cleaned regularly. Since November 2009 there is constant light and power for the suction machine provided by a solar system both in the operating theatre and in the delivery rooms. Close to these rooms there is a solar driven refrigerator to accommodate blood and drugs. The general conditions in the operating theatre are good; the hygiene conditions are very good.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1. General conditions: Blood bank
2. Delivery room: Forceps, curettage set, fetal heart-rate monitor, long gloves for deliveries
3. Delivery ward: Sphygmomanometer
4. Neonatal unit: Not working at all (incubator, instruments for intubation for the baby's)
5. Ultrasound scanning room: Ultrasound gel
6. Operating theatre: Anti-shock garments, anesthesia apparatus instruments for intubation, oxygen, Ambu bags

Hospital No. 13, Kaduna State – photo documentation

Ultrasound machine Toshiba

Delivery room

Operating theatre

Suction machine

Incubator (not working, no light, no oxygen)

Operating theatre

Operating theatre

Delivery ward

Delivery ward

Solar energy

Hospital No. 12, Kaduna State

Report:	**2008**	**2009**
Patients treated in antenatal clinic:	5,202	6,025
Deliveries:	949	974
Caesarean section:	51 (5.4%)	44 (4.5%)
Maternal mortality:	18 (1.9%)	13 (1.3%)
Fetal mortality:	79 (8.3%)	111 (11.4%)

General conditions:

The hospital is supplied by means of water tanks and pipes to the facilities. Electrical energy is not available at all times, although there is a generator in use. The use of computers is only possible in the office. A well-equipped laboratory exists. The general conditions are fair, and there are very good hygienic conditions throughout the hospital.

Staff:

One gynecologist and three general practitioners work in the hospital. They are responsible for the maternity unit as well as for all other units in the hospital. Moreover, there are seven midwives, six of whom also work as nurses. About 5,200 patients were treated in the antenatal clinic in 2008, the number rising to approximately 6,000 in 2009. In 2008, there were 949 deliveries in the hospital, 974 in 2009.

Delivery room:

In the delivery room there are three beds available for deliveries and one patient stretcher with foot rest. The room is supplied with one set of delivery instruments only, which are not in good condition. There is an episiotomy set and curettage set in use, but there is a lack of specula, forceps and vacuum extractors, which should be available in each delivery room. There are three sphygmomanometers for measuring blood pressure in the maternity unit. Neither fetal Doppler nor fetal heart-rate monitors are available in the delivery room. The delivery room is supplied with a baby scale. There is, however, a lack of long gloves and delivery instruments in good condition. The conditions in general are fairly good, and hygienic conditions are observed as very good.

Delivery ward:

The delivery ward is equipped with 13 beds for patients with various kinds of illnesses. All beds have mosquito nets. Drip systems are used in the delivery ward. A maternity record of information on the deliveries is updated regularly. There is a lack of adult scales. The conditions are fair in terms of equipment, and the hygienic conditions are assessed as very good.

Neonatal unit:

There is no neonatal unit available at the hospital; there are neither incubators nor any instruments for intubation of the babies. The services for the neonates are therefore limited.

Ultrasound scanning room:

A scanning room is available for ultrasound diagnosis, but the Shimadzu scanning machine inside the room is out of order. (In March 2010 the hospital received from Rotary International a new Mindray 2200 scanning machine. An experienced doctor from another participating hospital will come to train the doctor and midwives how to use the machine.

Operating theatre:

At the hospital one theatre nurse is responsible for the operating theatre. It contains one operating table with a theatre lamp. The existing anesthesia apparatus no longer works. Instruments for intubation and one Ambu bag are available, but no oxygen. The operating theatre is sufficiently equipped with instruments for surgery as well as three instrument sets for conducting a Caesarean section. An autoclaving unit for sterilizing these instruments is available and used. There is a lack of anti-shock garments to take care of the women in emergency situations. A postpartum room is available. The rating of the hygienic conditions at the operating theatre is very good and the equipment was observed to be in good condition.

Necessary improvements:

At the hospital there are some items which are urgently needed:

1.	General conditions:	Blood bank
2.	Delivery room:	Delivery instruments, specula, forceps, vacuum extractors, fetal Doppler, fetal heart-rate monitor, long gloves for deliveries
3.	Delivery ward:	Adult Scale
4.	Neonatal unit:	Not working at all (incubator, instruments for intubation for the baby's)
5.	Ultrasound scanning room:	Ultrasound scanning machine
6.	Operating theatre:	Anti-shock garments, anesthesia apparatus, oxygen, Ambu bags, theatre lamp

Hospital No. 12, Kaduna State – photo documentation

Delivery room

Delivery room

Delivery ward

Recovery room

Operating theatre

Suction machine

Operating theatre

Ultrasound machine Shimadzu (not working)

4.4.2. Synopsis of health care in obstetrics in Kaduna State

	Hospital No. 12	**Hospital No. 13**	**Hospital No. 14**	**Hospital No. 15**	**Hospital No. 16**
Staff					
Consultants OB/GYN	0	1 gyn., 1 paed.	0	0	0
Doctors OB/GYN	1 OB/GYN + 3 GP´s	3 GP´s	11 GP´s	5 GP´s	4 GP´s
Midwives/Nurses	7	13	9	8	13
CHEWS	0	0	0	0	0
Record officer	yes	yes	No	Yes	yes
Operating theatre					
Theatre nurses	1	2	4	2	7
Anesthesia Apparatus	0	0	1	0	2
Operating table	1	1	3	1	2
Instruments for operations	7	2	sufficient	3	1
Instruments for Intubation (mothers)	1	0	0	0	yes
Oxygen availability	yes	no	No	No	yes
Suction machine	1	1	1	1	2
Ambu bags	1	1	1	0	yes
Resuscitating equipment	0	yes	0	0	yes
Anti-shock garments	0	0	0	0	0
Set for Caesarean section	3	2	3	2	2
Autoclave	1	1	1	1	1
Theatre lamp	yes	1	Yes	not working	yes
Head light + battery charger	1				
OP functional	yes	yes	Yes	Yes	yes
Postpartum room	yes	yes	No	Yes	no
Hygienic conditions*	2	2	3	4	1
Equipment conditions*	3	3	4	4	2

	Hospital No. 12	**Hospital No. 13**	**Hospital No. 14**	**Hospital No. 15**	**Hospital No. 16**
Delivery room					
Delivery beds	3	2	4	3	2
Delivery instruments	1	5	1	2	3
Specula	0	2	1	1	1-2
Forceps	0	0	yes	0	yes
Vacuum extractor set	0	1	1	1	1
Episiotomy set	1	1	3	1	1
Delivery set	1	5	sufficient	2	3
Curettage set	1	0	1	1	yes, not in use
Sphygmomanometer	3	1	2	1	3
Fetal Doppler (only HR)	0	1	1	1	1
Fetal heart-rate monitor	0	0	0	0	0
Ultrasound scanning machine	Shimadzu, not in use	Fujitsu, not in use; Toshiba, in use	yes, used once a week	Siemens, in use	Mindray, in use
Patient stretch + foot rest	1	1	1	1	1
Long gloves	no	no	yes	no	no
Baby scale	1	1	1	0	1
Hygienic conditions*	2	2	4	5	2
Equipment conditions*	3-4	3	6	5	3
Neonatal unit	no	no	no	no	yes
Incubator	0	0	0	0	yes
Instruments for Intubation (babies)	0	0	0	0	3
Hygienic conditions*	6	6	6	6	2
Equipment conditions*	6	6	6	6	3

	Hospital No. 12	**Hospital No. 13**	**Hospital No. 14**	**Hospital No. 15**	**Hospital No. 16**
Obstetrical ward/ ANC					
Number of beds	13	15	15	14	6
Drip stands	yes	yes	yes	Yes	yes
Mosquito nets	yes	yes	yes	in cleaning	yes
Scanning room (ultrasound)	yes	yes	yes	Yes	yes, well equipped
Mother scales	0	1	1	0	1
Hygienic conditions*	2	2	4	3	2
Equipment conditions*	4	3	4	4	3
VVF Surgery	no	no	yes	No	no
General conditions					
Water supply – Bore hole	yes	good	water tank, dirty water	Good	good
Electricity	not working well	good	not all the time, solar light	not all time	good
Windows (properly fitted and sealed)	no	good	no	No	yes, glass bricks
Generator	yes	yes	yes	Yes	yes
Refrigerator	yes	yes	yes	0	yes
Computer	only in office	office + secretary	office	office + secretary	1 in office
Mg- Sulphate	yes	yes	yes	Yes	yes
Blood bank available	no	no	no	No	no
Hygiene conditions (overall)*	2	2	4	3	2
Equipment conditions*	3-4	2	2	3	2

	Hospital No. 12	**Hospital No. 13**	**Hospital No. 14**	**Hospital No. 15**	**Hospital No. 16**
Laboratory	yes	yes	Yes	yes	yes
Hygienic conditions*			3		
Equipment conditions*	fairly good conditions	good	4	good	very good
Report 2009					
Delivery record book	yes	yes	yes, 3 books	yes	yes
Number of deliveries	974	2,298	1,897	1,134	2,720
Caesarean section	44 (4.52%)	155 (6.74%)	134 (7.06%)	131 (11.55%)	156 (5.74%)
Eclampsia	73 (7.49%)	20 (0.87%)	169 (8.91%)	141 (12.43%)	83 (3.05%)
Hemorrhage	34 (3.49%)	85 (3.70%)	72 (3.80%)	51 (4.50%)	70 (2.57%)
Maternal deaths	13 (1.33%)	8 (0.35%)	22 (1.16%)	22 (1.94%)	14 (0.51%)
Fetal deaths	111 (11.40%)	119 (5.18%)	153 (8.07%)	201 (17.72%)	214 (7.87%)
Grand Total Rating					
Hygienic conditions (5-30)*	14	14	21	21	9
Equipment conditions (5-30)*	20	17	22	22	13

* For the evaluation the "Score criteria for general status" and "Score criteria for hygiene condition" have been used. The

1. Operating theatre
2. Delivery room
3. Neonatal unit
4. Delivery ward/Antenatal clinic
5. General conditions

have each been rated from one (excellent) to six (very poor). The total score according to the points given for each subdivision ranged from minimum five points to maximum thirty points for general status and from five to thirty points for hygiene condition, in total from ten to sixty.

4.5. Equipment and hygienic conditions in ten hospitals in Kano State and Kaduna State

4.5.1. Methods of evaluation

The hospitals were evaluated according to the equipment and hygienic status of the operating theatre, delivery room, neonatal unit, obstetrical ward/antenatal clinic and variable factors, such as water supply and others. Each unit was evaluated by a score from one (best result) to six (worst result). A score of ten equals excellent conditions and 60 indicates worst conditions for both hygienic and equipment conditions. Hospitals with the lowest score of 20-40 in three out of four cases had the lowest maternal mortality of about 500 per 100,000 deliveries, and hospitals with the highest score of about 45-50 had the highest maternal mortality of 2000 per 100,000 deliveries in 2009.

The following list shows the score criteria for the evaluation of the ten hospitals in Kano State and Kaduna State. Each room of the maternity unit was assessed by using the score criteria for the equipment and the hygienic conditions.

Each of the five items has been valued from one (excellent) to six (very poor) for general conditions and for hygiene conditions. Accordingly, the total score was from five to thirty points for equipment rating and from five to thirty for hygienic rating, totaling ten to sixty score points. The score points were used to identify a relationship between maternal mortality and the score for each hospital.

The following table shows the various evaluation criteria for equipment and hygienic conditions in the operating theatre, delivery room, neonatal unit, delivery ward/antenatal clinic and general conditions. The score values were related to the maternal mortality in 2009.

Score criteria for equipment	Score criteria for hygiene
Operating theatre	
• Anesthesia apparatus	• Condition of the floor
• Operating table	• Cleanness of sink
• Resuscitation equipment	• Cleanness of apparatus
• Instruments for operations	• Dust inside rooms
• Intubation set	• Blood-stained equipment
• Suction machine	• Cleanness of resuscitation equipment
• Anti-shock garments	• Filled suction machines
• Oxygen availability	• Sterilizing condition
• Ambu bags	• Blood-stained walls
• Caesarean section set	• Availability of operating shoes
• Theatre lamp	• Unorganized storage of material
• Sterilizer	• Cleanness maternity record book
Delivery room	
• Delivery beds	• Dust inside rooms
• Delivery instruments	• Blood-stained delivery beds
• Specula	• Rusty instruments
• Vacuum extractor	• Rusty delivery beds
• Episiotomy set	• Conditions in bowls for sterilizing
• Delivery set	• Condition of mattresses
• Baby scale	• Hand disinfection
• Gloves	• Resuscitation units for newborns
Neonatal unit	
• Incubator	• See delivery room
• Instruments for intubation + resuscitation	
• Baby scale	
• Suction apparatus	
Delivery ward/Antenatal clinic	
• Number of beds	• Conditions of beds
• Drip system	• Dust-covered mattresses
• Mosquito nets	• Condition of the floor
• Maternity record book	• Availability of mosquito nets
• Ultrasound scanning room	• Cleanness of ultrasound probes
• Mother scales	• Dusty instruments
• Sphygmomanometer	• Dust stained windows
General conditions	
• Water supply, bore hole	• Hygiene of sinks
• Electricity (power supply)	• Hygiene of toilets
• Window form and good seal	• Cobwebs
• Generator	• Gloves
• Refrigerator	• Aprons
• Magnesium sulfate	• Masks
• Blood bank availability	• Storage of files

4.5.2. Equipment conditions in relation to the maternal mortality in 2009

Equipment rating	Operating theatre	Delivery room	Neonatal unit	OB/Gyn ward	General conditions	Equipment rating total (5-30)	**Maternal mortality per 100,000 deliveries**
Hospital 26	4	4	6	4	4	22	**1,600**
Hospital 25	5	5	6	3	4.5	23.5	**1,550**
Hospital 24	4.5	6	6	4	4.5	25	**2,590**
Hospital 23	2	4	6	4	3	19	**820**
Hospital 22	5	4	6	4	4.5	23.5	**1,630**
Hospital 16	2	3	3	3	2	13	**510**
Hospital 15	4	5	6	4	3	22	**1,940**
Hospital 14	4	6	6	4	2	22	**1,160**
Hospital 13	3	3	6	3	2	17	**350**
Hospital 12	3	3.5	6	4	3,5	20	**1,330**

Table 2: *Equipment rating in the participating hospitals*

Figure 28 shows the relationship between hospital equipment in the obstetrical facilities and maternal deaths per 100,000 deliveries. The hygienic conditions are not taken into consideration. A good rating of the equipment is closely related to a low maternal mortality of about 500 per 100,000 deliveries, whereas high ratings are associated with a high maternal mortality.

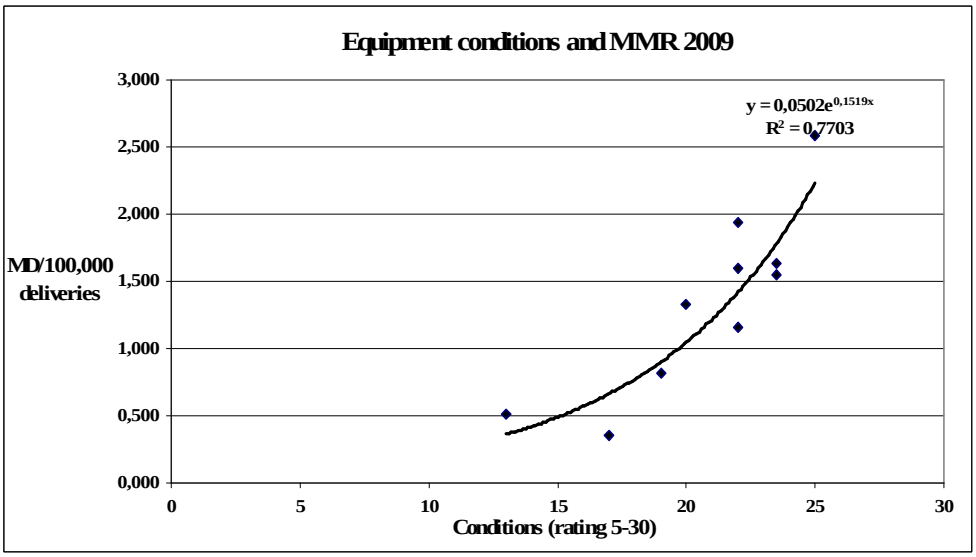


Figure28:

Relationship between hospital equipment in the obstetrical facility and maternal deaths per 100,000 deliveries.

4.5.3. Hygienic conditions in relation to the maternal mortality in 2009

Hygiene rating	Operating theatre	Delivery room	Neonatal unit	OB/Gyn ward	General conditions	Hygiene rating total (5-30)	**Maternal mortality per 100,000 deliveries**
Hospital 26	4	4	6	4	4	22	**1,600**
Hospital 25	5	5.5	6	5	4.5	26	**1,550**
Hospital 24	3	5	6	4	4	22	**2,590**
Hospital 23	2	4	6	4	3.5	19.5	**820**
Hospital 22	5	5	6	4	4	24	**1,630**
Hospital 16	1	2	2	2	2	9	**510**
Hospital 15	4	5	6	3	3	21	**1,940**
Hospital 14	3	4	6	4	4	21	**1,160**
Hospital 13	2	2	6	2	2	14	**350**
Hospital 12	2	2	6	2	2	14	**1,330**

Table 3: *Hygiene rating in the participating hospitals*

Figure 29 shows the relationship between the hygiene rating in the maternity unit and maternal deaths per 100,000 deliveries. The equipment conditions are not taken into consideration. A good rating of the hygienic conditions is related to a low maternal mortality of about 500 per 100,000 deliveries, whereas high ratings are associated with a high maternal mortality.

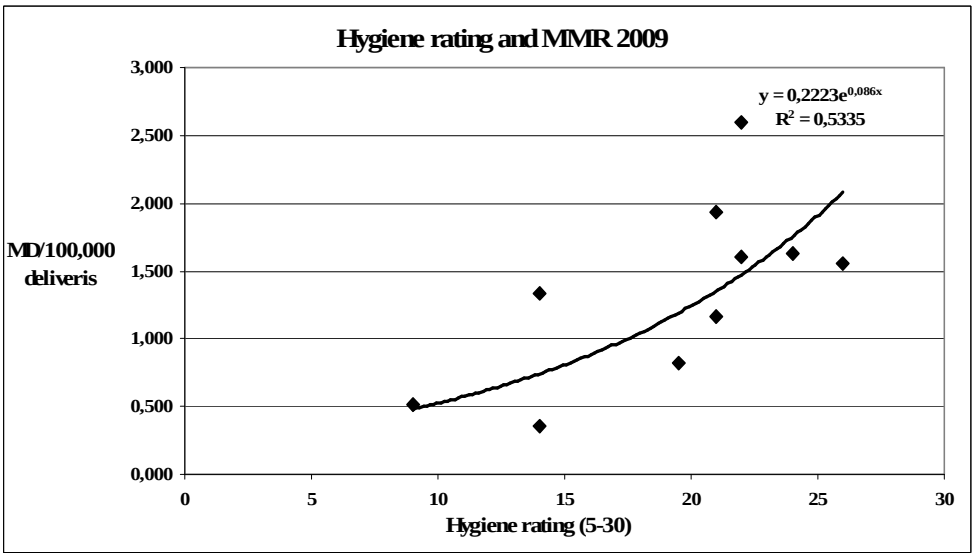


Figure 29:

Relationship between hygiene rating in the maternity unit and maternal deaths per 100,000 deliveries.

4.5.4. General conditions in relation to the maternal mortality in 2009

Equipment rating and Hygiene rating	Equipment rating total (5-30)	Hygiene rating total (5-30)	Conditions total (10-60)	**Maternal mortality per 100,000 deliveries**
Hospital 26	22	22	44	**1,600**
Hospital 25	23.5	26	49.5	**1,550**
Hospital 24	25	22	47	**2,590**
Hospital 23	19	19.5	38.5	**820**
Hospital 22	23.5	24	47.5	**1,630**
Hospital 16	13	9	21	**510**
Hospital 15	22	21	43	**1,940**
Hospital 14	22	21	43	**1,160**
Hospital 13	17	14	31	**350**
Hospital 12	20	14	34	**1,330**

Table 4: *Equipment rating and hygiene rating in the participating hospitals*

Figure 30 contains both, equipment and hygienic conditions in relation to maternal deaths per 100,000 deliveries in 2009. A good rating of the total conditions (hygienic and equipment conditions) is related to a low maternal mortality. Hospitals with the lowest score of 20-40 in three out of four cases had the lowest maternal mortality of about 500 per 100,000 deliveries, and hospitals with the highest score of about 45-50 had the highest maternal mortality of 2000 per 100,000 deliveries in the first half of 2009.

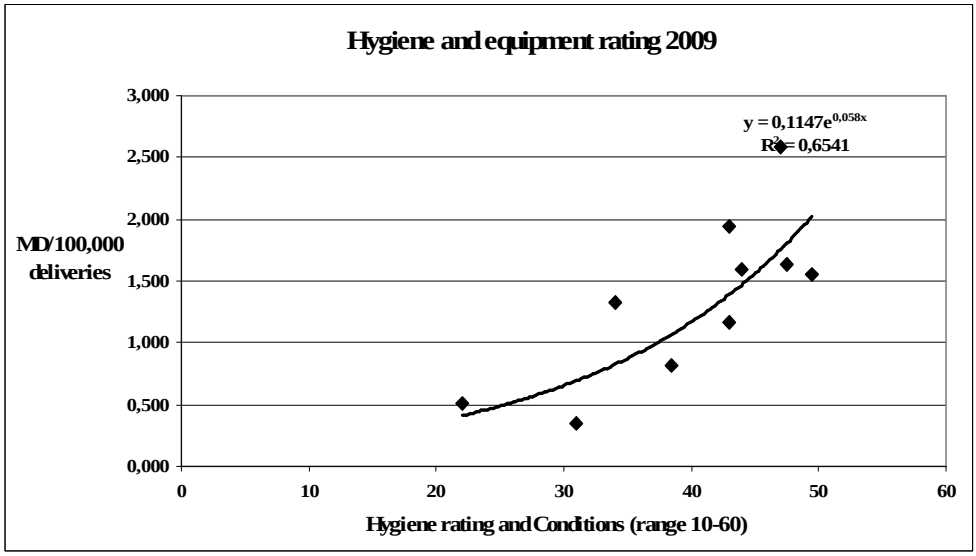


Figure 30:

Relationship between the state of the hospital equipment in the obstetrical facility and hygienic conditions and maternal mortality.

4.5.5. Personnel structure and maternal mortality

For the evaluation of the personnel structure the number of midwives in every single hospital is correlated to the number of childbirths in the respective hospital in 2009. The number of childbirths in each hospital divided by the number of midwives shows a range between 104.6 to 634.3 deliveries per midwife in year 2009 in the ten hospitals. Furthermore the numbers of deliveries per midwife were correlated to the maternal mortality in the hospitals in 2009.

Number of midwives per delivery	Midwives	Deliveries in 2009	Deliveries/Midwife 2009	**Maternal mortality per 100,000 deliveries**
Hospital 26	6	1,818	303.0	**1,600**
Hospital 25	2	645	322.5	**1,550**
Hospital 24	6	733	122.2	**2,590**
Hospital 23	14	1,464	104.6	**820**
Hospital 22	3	1,903	634.3	**1,630**
Hospital 16	13	2,720	209.2	**510**
Hospital 15	8	1,134	141.8	**1,940**
Hospital 14	9	1,897	210.8	**1,160**
Hospital 13	13	2,298	176.8	**350**
Hospital 12	7	974	139.1	**1,330**

Table 5: *Personnel structure (number of midwives per delivery) and maternal mortality*

Figure 31 shows the relationship between the numbers of midwives employed in the hospitals and the number of deliveries in the respective hospitals in 2009. The grey line shows a comparative value of ten midwives per 1000 deliveries in one year (100 deliveries per midwife); this ideal value should be aimed for all hospitals. The black line shows the relationship between the number of midwives and the number of deliveries in the ten hospitals in Kano State and Kaduna State in 2009.

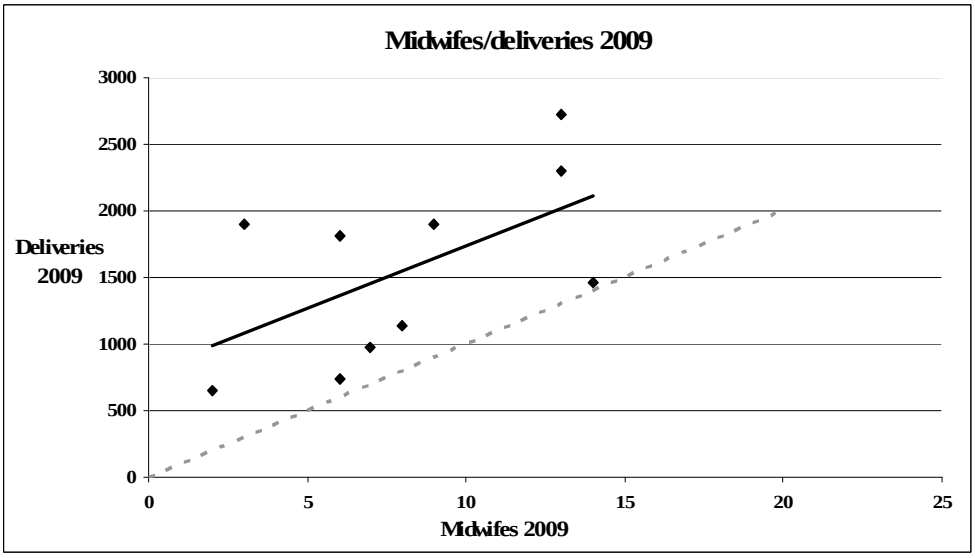


Figure 31:

Relationship between the number of midwives and the number of deliveries in year 2009.

The relationship between the number of deliveries per midwife and the maternal mortality in 2009 depicts in figure 32. The graph shows no clear correlation between the number of deliveries per midwife and the maternal mortality. The hospitals with the highest (above 2500 per 100,000 deliveries) and the lowest (350 per 100,000 deliveries) maternal mortality both have a low number of deliveries per midwife. The hospitals with the highest maternal mortality have 122 deliveries per midwife, the hospital with the lowest maternal mortality 177 deliveries per midwife in 2009. The hospital with the highest number of deliveries per midwife (634 in 2009) shows a maternal mortality in the medium range of the ranking (1630 per 100,000 deliveries).

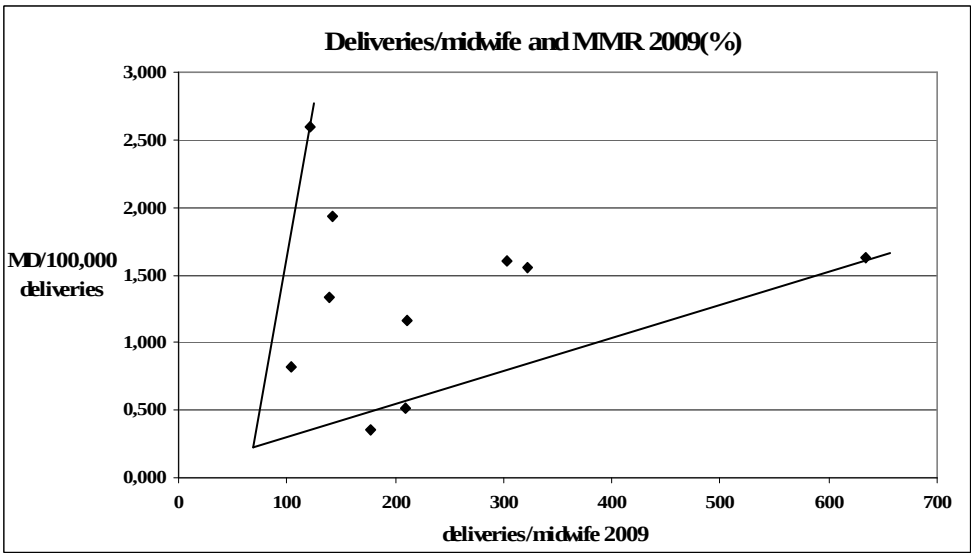


Figure 32:

Relationship between the number of deliveries per midwife and the maternal mortality in 2009. There is no correlation between the indicators MMR and deliveries per midwife. The causes have to be investigated.

4.6. References

[1] Maternal and Child Health Hospital – Report 2009,
Kano State and Kaduna State

[2] Oladapo OT, Adetoro OO, Fakeye O, Ekele BA, Fawole AO, Abasiattai A, Kuti O, Tukur J, Ande AB, Dada OA; Nigerian Network for Reproductive Health Research and Training (NNRHRT): National data system on near miss and maternal death: shifting from maternal risk to public health impact in Nigeria.
Reprod Health. 9;6:8., doi:10.1186/1742-4755-6-8, 2009 Jun.

5. Obstetrical management in Kano State and Kaduna State Hospitals in 2008 and 2009

5.1. Instruments of data collection

5.2. Results of obstetrical management in 2008 and 2009 in Kano State and Kaduna State

5.2.1 Maternal and fetal mortality
- Maternal mortality ratio (MMR)
- Maternal mortality ratio (MMR) in relation to the number of deliveries
- Fetal mortality ratio (FMR)
- Fetal mortality in relation to maternal mortality

5.2.2. Interventions and fetal mortality
- Caesarean section (CS)
- Relationship between CS- rate and fetal mortality ratio
- Relationship between the number of deliveries in a hospital and fetal mortality

5.2.3. The incidence of postpartum hemorrhage, eclampsia and number of deliveries in relation to maternal mortality
- Incidence of postpartum hemorrhage (PPH)
- Relationship between postpartum hemorrhage (PPH) and maternal mortality
- Postpartum hemorrhage (PPH) in relation to the number of hospital deliveries
- Incidence of eclampsia with and without fits
- Incidence of eclampsia in relation to the number of deliveries

5.2.4. Clinical profile 2009

5.3. Discussion of the investigation and conclusions for further management

5.3.1. Selection of the hospitals
5.3.2. Discussion of the results
5.3.3. Condition of the hospitals
5.3.4. Reliability of data collection

5.4. References

5. Obstetrical management in Kano State and Kaduna State Hospitals in 2008 and 2009

5.1. Instruments of data collection

The descriptive study was carried out in Kano State and Kaduna State, both situated in north of Nigeria, and gives a view of associations between postpartum hemorrhage, eclampsia, the number of deliveries and maternal mortality. Five hospitals in Kano State and five hospitals in Kaduna State were selected to take part in data collection for quality assurance in obstetrics. The ten hospitals participating in data collection are secondary health facilities with different equipment status, as described in the Hospital Audit above. All hospitals were supplied with magnesium sulfate by the government for the treatment of eclamptic patients.

From January 2008 till December 2009 a questionnaire based on a maternal record book with simple indicators of maternal and child health care was used to collect data in the ten hospitals. The data were routinely collected monthly by a chief midwife. The questionnaire comprises the following data:

- Number of antenatal care (new, follow up)
- Number of abortions
- Number of deliveries (spontaneous, breech, forceps, vacuum, CS)
- Number of twins
- Fetal outcome (alive, dead)
- Eclampsia (preeclampsia, eclampsia)
- Postpartum hemorrhage
- Retained placenta
- Maternal death

The following questionnaire was used for the monthly data collection.

MONTHLY MATERNITY STATISTICS 2ND QUARTER																		**Year: 2009**
Hospital's Name: FIVE ADOPTED HOSPIALS – KANO STATE **MAY**																		
	ANC	**ANC**	**ABORTION**	**DELIVERIES**								**FETAL OUTCOME**		**ECLAMPSIA**		**POST PART**		**No of MATERNAL death**
	New	**Follow – Up**	**MVA**	**D/C**	**No. of Spont Deliveries**	**No of Multi Deliveries**	**No. of Breech Deliveries**	**No. of Vacuum Deliveries**	**No. of C/S Deliveries**	**No. of Forceps Deliveries**	**No. of Total Deliveries**	**Alive**	**Dead**	**Pre-Eclampsia**	**Eclampsia**	**PPH**	**Retained Placenta**	
Gaya	307	478	12	0	157	4	15	0	8	0	184	175	9	15	14	6	9	3
S/Jidda	711	734	1	0	107	2	3	0	4	0	116	95	7	0	10	2	0	0
Sumaila	429	412	7	0	36	1	3	0	4	0	44	33	12	6	12	6	8	1
Takai	306	311	1	2	63	3	1	0	5	0	72	69	3	4	9	4	2	2
Wudil	730	1,206	2	2	136	5	6	0	5	0	152	149	8	7	14	0	8	3
Total	**2403**	**3141**	**23**	**4**	**499**	**15**	**28**	**0**	**26**	**0**	**568**	**521**	**39**	**32**	**59**	**18**	**27**	**9**

All deliveries carried out in the ten hospitals in Kano and Kaduna State were registered, therefore all maternal and fetal deaths occurred in these hospitals as well as way of delivery and complications before, during and after delivery were noted.

Data analysis was carried out in semi-annual intervals using Excel. Means and frequencies of each item were calculated by the data sources above. The data give a view of maternal and fetal mortality, the influence of intervention like Caesarean section on fetal and maternal mortality and associations between postpartum hemorrhage, eclampsia, the number of deliveries and maternal mortality can be evaluated.

	Deliveries N	**CS** n (%)	**MMR** n (per 100.000 deliveries)	**FMR** n (%)	**Eclampsia** n (%)	**PPH** n (%)
Jan – Jun 2008	6,878	494 (7.18)	123 (1,790)	584 (8.49)	484 (7.04)	301 (4.38)
July – Dec 2008	7,369	451 (6.12)	120 (1,630)	653 (8.86)	490 (6.65)	333 (4.52)
Jan – June 2009	7,695	457 (5.94)	106 (1,380)	750 (9.75)	779 (10.12)	255 (3.31)
July – Dec 2009	7,891	369 (4.68)	74 (940)	659 (8.35)	776 (9.83)	394 (4.99)
Total 2008 and 2009	29,833	1,771 (5.94)	423 (1,420)	2,646 (8.87)	2,529 (8.48)	1,283 (4.30)

Table 6: *Obstetrical data in 10 participating hospitals between January 2008 and December 2009*

The number of 29,833 deliveries was carried out in the ten hospitals in 2008 and 2009 with an average of 1,420 maternal deaths per 100,000 deliveries and an average of fetal mortality of 8.87% within two years. There was a decrease of the maternal mortality over two years from 1,790 maternal deaths per 100,000 deliveries in first half-year 2008 to 940 MD/100,000 deliveries in second half-year 2009.

The average of Caesarean section rate was 5.94% in two years. 2,529 pregnant women (8.48%), who delivered in the ten hospitals, suffered from eclampsia. Complications of postpartum hemorrhage occurred in 1,283 patients (4.3 %) within two years.

5.2. Results of obstetrical management in 2008 and 2009 in Kano State and Kaduna State

5.2.1. Maternal and fetal mortality

Between January 2008 and December 2009 29,833 women gave birth in the ten selected hospitals in Kano and Kaduna States. The range of deliveries per half-year in the ten hospitals was 232 deliveries in hospital 25 in second half-year 2008 to 1,548 deliveries in hospital 16 in second half-year 2008 (figure 33).

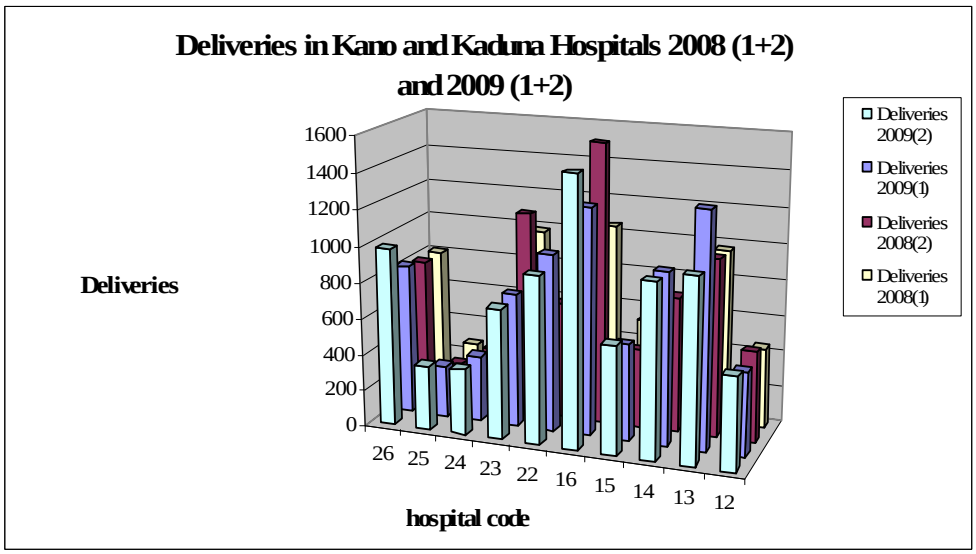


Figure 33:

Distribution of deliveries in ten hospitals in four half-years in 2008 and 2009.
A wide range of deliveries per half year (from 232 to 1,548 deliveries) exists.

Figure 34:

Delivery ward in a hospital in Kaduna State

Maternal mortality ratio (MMR)

The maternal mortality ratio ranged within four half-years in the different hospitals from 90 maternal deaths per 100,000 deliveries (hospital 23, 2008/2) to 6,170 MD/100,000 deliveries (hospital 24, 2008/1). The maternal mortality ratio displayed a wide variation among the hospitals. In most hospitals the MMR fell from first half-year 2008 to second half-year 2009, e.g. in hospital 14 maternal mortality fell from 3,930 MD/100,000 deliveries in first half-year 2008 to 320 MD/100,000 deliveries in second half-year 2009.

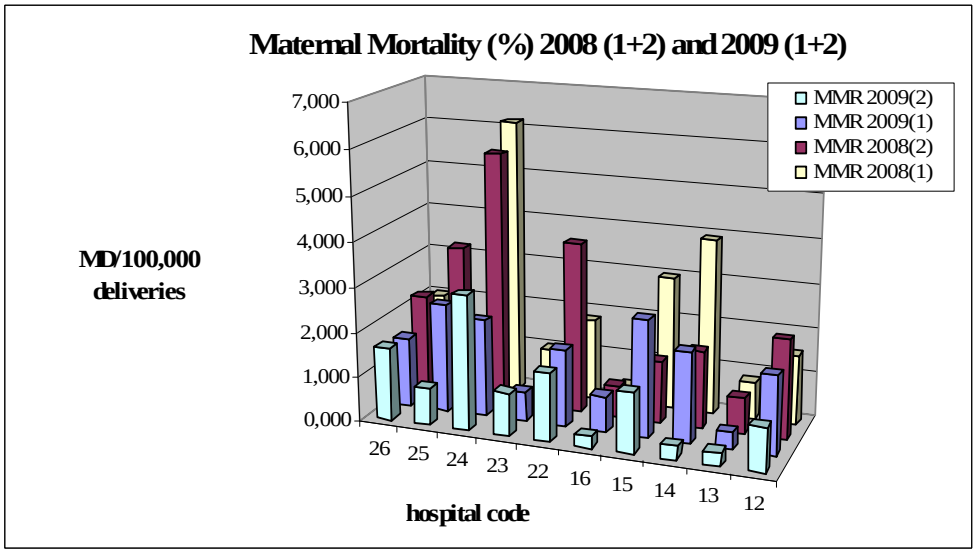


Figure 35:

Maternal mortality in ten hospitals in four half-years in 2008 and 2009.
There was a wide range of the maternal mortality in all hospital, mostly with a decreasing maternal mortality.

The fall of the maternal mortality from January 2008 to December 2009 is shown in figure 36, 37 and 38. Maternal mortality decreased from 1,790 MD/100,000 deliveries to 940 MD/100,000 deliveries in the ten hospitals. In the observation time period the maternal mortality fell by 47.5%.

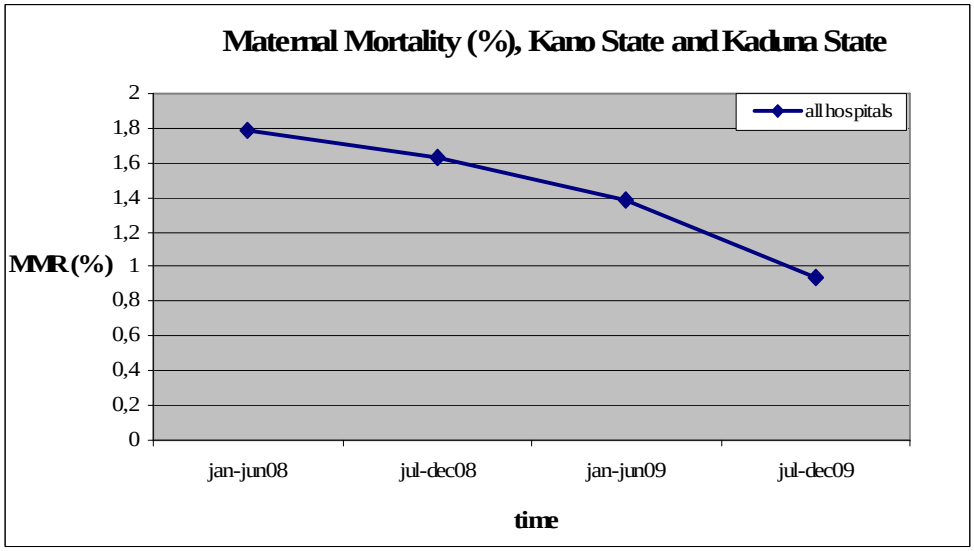


Figure 36:

Maternal mortality in ten hospitals from January 2008 to December 2009.
The maternal mortality decreases from 1,790 MD/100,000 deliveries to 940 MD/100,000 deliveries in four half-years, which is a drop of almost 50% of maternal mortality.

Figure 37 represents the fall of maternal mortality in a box-and-whisker diagram. The median of maternal mortality fell from 1.68% in first half-year 2008 to 0.79% in first half-year 2010 in the ten hospitals. A wide range of the upper adjacent values, which represents the hospital with the highest maternal mortality in the respective period, is shown. Data collection with extreme outliners is shown in first half-year 2008 and in first half-year 2010.

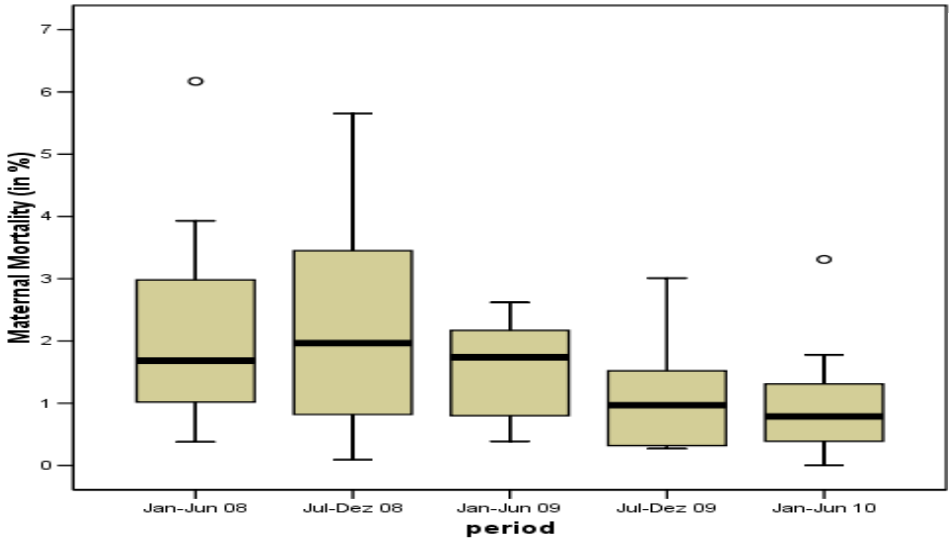


Figure 37:

Boxes represent 25th and 75th percentiles of the observations, with the middle bar representing the median, and the whiskers marking the upper and lower adjacent values (minimal and maximal value). Dots represent extreme outliners.

Figure 38 shows the fall of maternal mortality in the two selected regions of northern Nigeria, Kano State and Kaduna State. The blue box plots represent the maternal mortality of Kaduna State within five half-years from January 2008 to June 2010. The median of maternal mortality nearly decreases constantly within five half-years from 1.56% in first half-year 2008 to 0.65% in first half-year 2010 in Kaduna State.

The green box plots represent the fall of maternal mortality in Kano State. The maternal mortality in Kano State shows some variations over the observation period, but still a slight decrease of the median range from 1.81% in first half-year 2008 to 1.31% in first half-year 2010.

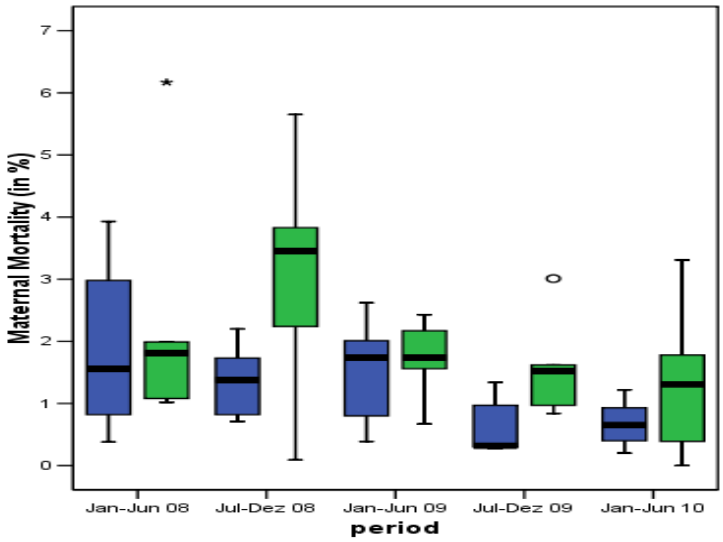


Figure 38:

Blue boxes representing the maternal mortality in five hospitals in Kaduna State, green boxes in five hospitals in Kano State.
Boxes representing the 25th and 75th percentiles with the middle bar representing the median of maternal mortality in the five respective hospitals. Whiskers marking the upper and lower adjacent values (minimal and maximal value). Dots represent extreme outliners.

Maternal mortality ratio (MMR) in relation to the number of deliveries

In figure 39 the decreasing maternal mortality of the four half-years from January 2008 to December 2009 is shown. The graph displays the interesting information, that smaller hospitals with a lower number of deliveries in a semi-annual period had a higher percentage of maternal deaths as hospitals with a higher number of deliveries in a half-year period. The reduction of the MMR in 2008 and 2009 could be obtained primarily in the hospitals with a lower birth rate per half-year.

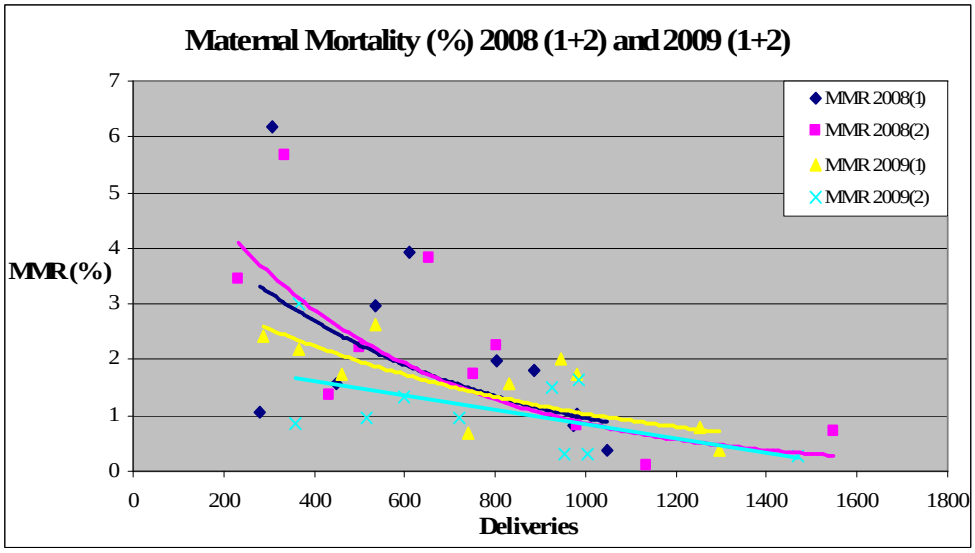


Figure 39:

Maternal mortality in four half-years in 2008 and 2009 with a decreasing maternal mortality in four half-years.

Fetal mortality ratio (FMR)

Similar to the maternal mortality there was also a wide range of the fetal mortality in the ten hospitals. The fetal mortality rate had a range from 1.93% (hospital 23, 2008/1) to 24.57% (hospital 25, 2008/2) in 2008 and 2009. The fetal mortality did not decrease similar to maternal mortality in 2008 to 2009. The mean fetal mortality was 8.49% in all hospitals in first half-year 2008 and 8.35% in second half-year 2009, i.e. no decrease of the fetal mortality rate during the time of observation recorded.

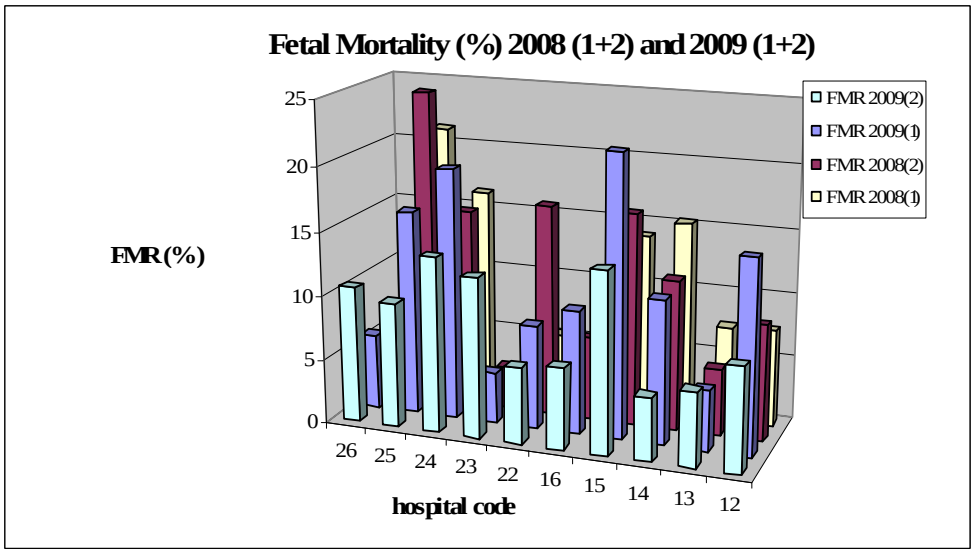


Figure 40:

Fetal mortality in ten hospitals in four half-years in 2008 and 2009.
There was no decreasing fetal mortality in the ten hospitals in Kano and Kaduna State in year 2008 and 2009.

Fetal mortality in relation to maternal mortality

In figure 41 a relationship between the maternal and fetal mortality is shown. As expected a lower maternal mortality is accompanied by a lower number of fetal deaths. The relationship shows however a wide variation throughout 2008 and 2009. No indicators are available that explain the variation.

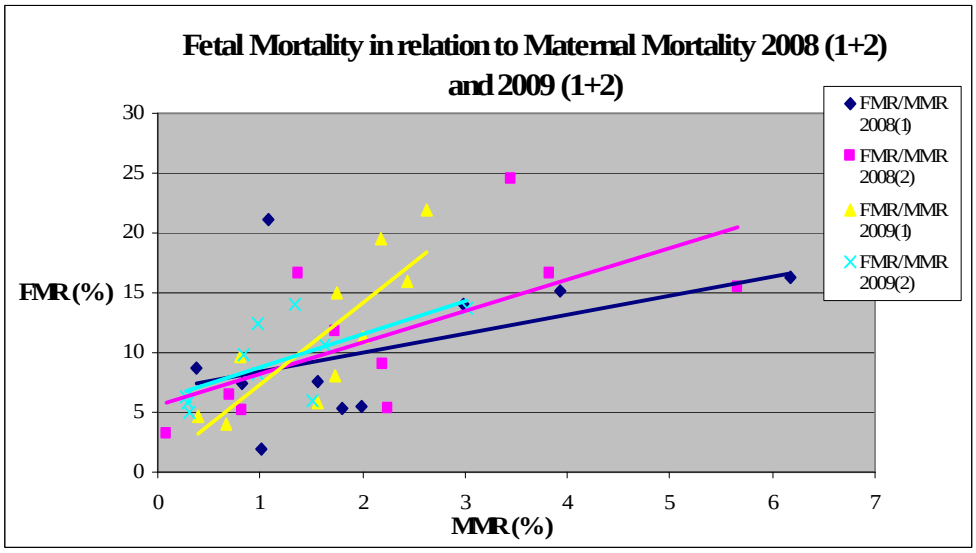


Figure 41:

Relationship of maternal and fetal mortality in 2008 and 2009.
A low maternal mortality is affiliated with a low fetal mortality in the same hospital.

5.2.2. Interventions and fetal mortality

Caesarean section (CS)

The Caesarean section rate shows a wide variation in the ten hospitals. It ranged from 1.99% (hospital 26, 2008/2) to 13.62% (hospital 25, 2008/1) in four half-years in all ten hospitals (figure 42). Also in single hospitals a big difference of the Caesarean section rate between the half-years was shown, e.g. hospital 25 with a Caesarean section rate of 13.62% in first half-year 2008 changed to 2.52% in second half-year 2009. The Caesarean section rate decreased on average in all hospitals from first half-year 2008 to second half-year 2009 from 7.18% to 4.68%. The reasons for this change could not be identified.

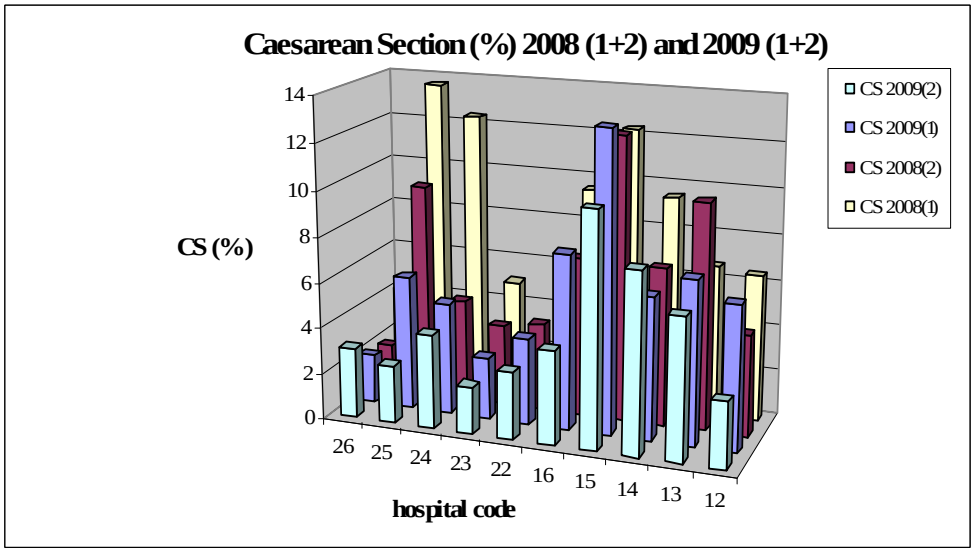


Figure 42:

Caesarean section rate in ten hospitals in four half-years in 2008 and 2009.

Relationship between CS-rate and fetal mortality ratio

In figure 43 the relationship between the Caesarean section rate and the fetal mortality ratio is demonstrated. Hospitals with a higher Caesarean section rate had surprisingly a higher ratio of fetal death during time of observation. Fetal mortality rate in hospitals should fall when the Caesarean section rate increases. An explanation for this kind of relationship could be that the Caesarean sections are carried out to save mothers life even if the fetus is already dead, e.g. if the mothers could not reach the hospital in time during prolonged labor. The Caesarean sections with this indication are also included in the data collection and could give reasons for the relationship of FMR and CS-rate. In second half-year 2009 the relationship changed compared to the three half-years before.

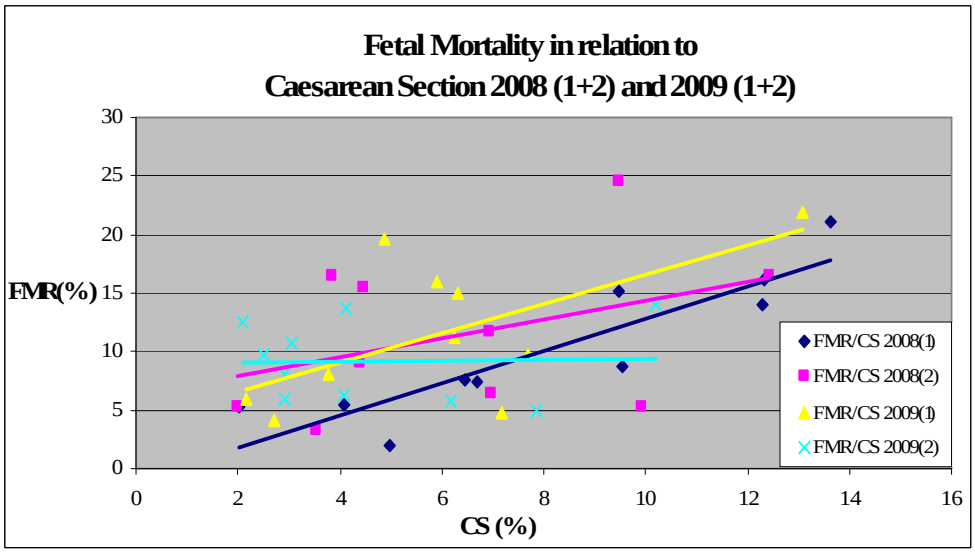


Figure 43:

Fetal mortality rate in relation to Caesarean section rate in four half-years in 2008 and 2009.

Relationship between the number of deliveries in a hospital and the fetal mortality

Similar to the maternal mortality also the fetal mortality is dependent on the number of deliveries in the respective hospital. In smaller hospitals with a lower number of deliveries a higher number of fetal deaths were registered than in hospitals with a higher number of deliveries. Figure 44 demonstrates the relation of the fetal mortality rate and the number of deliveries in the respective hospitals in the observation time over two years.

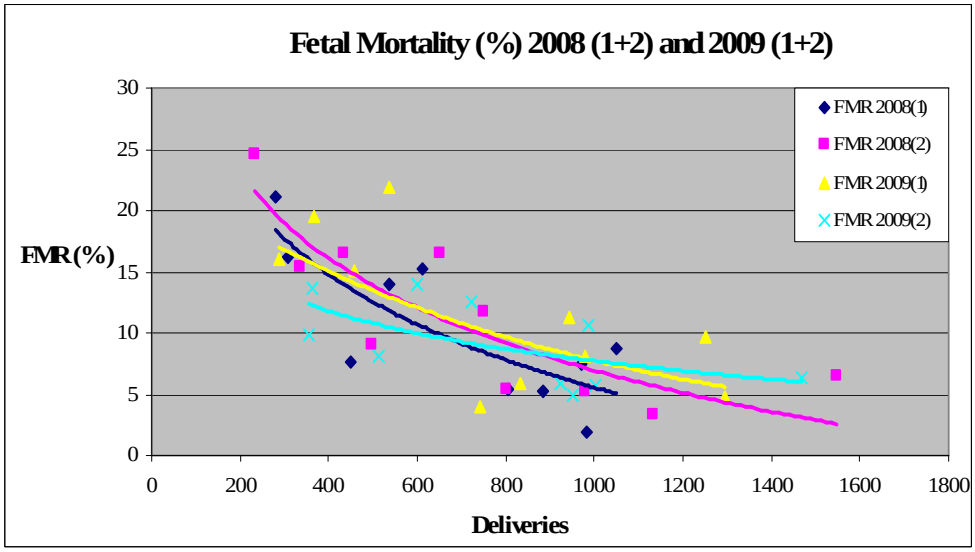


Figure 44:

Fetal mortality rate in relation to number of deliveries in four half-years in 2008 and 2009.

5.2.3. The incidence of postpartum hemorrhage, eclampsia and number of deliveries in relation to maternal mortality

Incidence of postpartum hemorrhage (PPH)

Postpartum hemorrhage is one of the main reasons for maternal death in the hospitals in developing countries. On average there was no decreasing postpartum hemorrhage registered in the ten hospitals. In some hospitals there was a wide range of postpartum hemorrhage over the four half-years. As an example the postpartum hemorrhage fell in hospital 25 from 23.3% in first half-year 2008 to 5.21% in first half-year 2009 and increased again to 21.85% within one half-year. On average the postpartum hemorrhage was 4.45% in year 2008 and 4.16% in year 2009 in all hospitals. Only two hospitals (hospital 24 and 25) registered a postpartum hemorrhage over 10% during the time of observation. There should be a careful examination of the reliability of these data, also for the reason, that measurement of blood loss is limited in the hospitals in Nigeria. Suction machines for the measurement in the operation theatre as well as functioning mother scales in delivery rooms as a simple instrument for the estimation of blood loss, are not available or not in use in most of the hospitals.

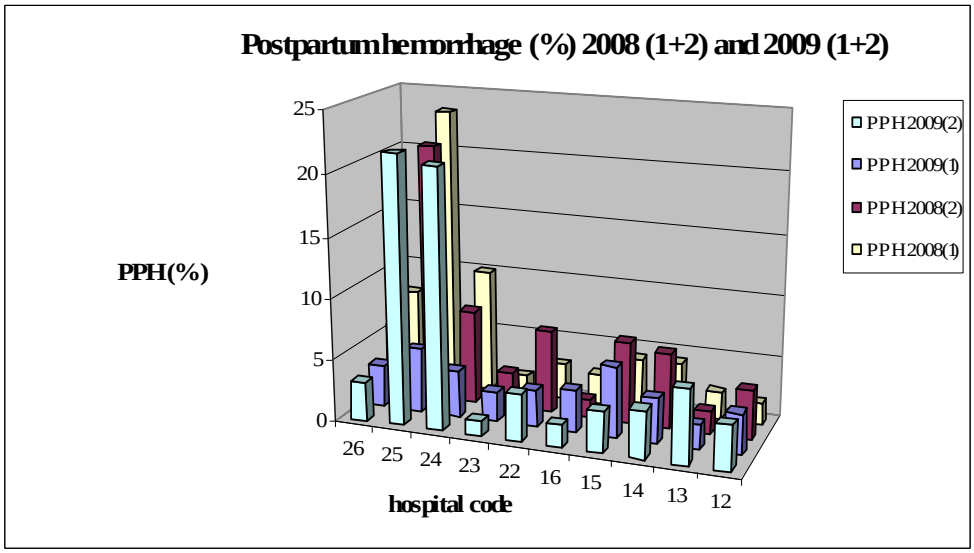


Figure 45:

Postpartum hemorrhage in ten hospitals in four half-years in 2008 and 2009.

Relationship between postpartum hemorrhage (PPH) and maternal mortality

Postpartum hemorrhage is one of the main reasons for maternal death. In figure 46 the relationship of the postpartum hemorrhage and the maternal mortality rate in the hospitals is shown. Only two of the hospitals registered a PPH over 10% in the time of observation. The scatter from this not displays a close relationship in 2008 than in 2009, which could be an indicator for management of postpartum hemorrhage in the hospitals, e.g. training of using anti-shock garments and the conduction of Caesarean section in earlier stage of PPH if necessary.

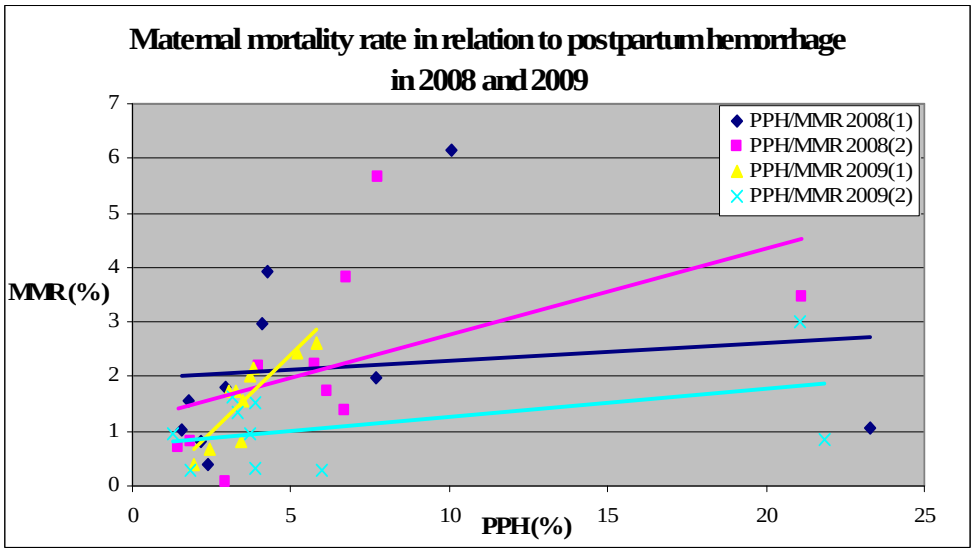


Figure 46:

Maternal mortality rate in relation to rate of postpartum hemorrhage in four half-years in 2008 and 2009.

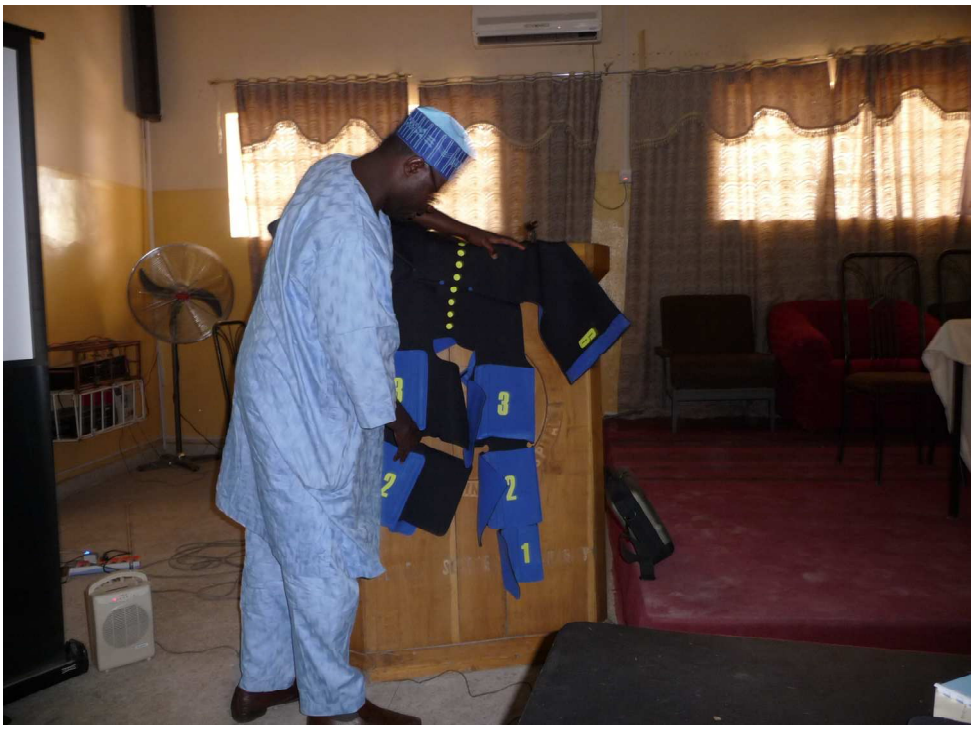


Figure 47:

Ant- shock garment

Postpartum hemorrhage (PPH) in relation to the number of hospital deliveries

Figures 39 and 44 demonstrate the relationship between maternal and fetal mortality ratio and the number of deliveries. There is also a relationship between the postpartum hemorrhage and the number of deliveries in the respective hospitals (figure 48). Hospitals with a higher number of deliveries had a lower number of women who suffer from postpartum hemorrhage as smaller hospitals within a semi-annual period. In 2009 this relationship was not as obvious as it was shown in 2008. In first half-year 2009 there was almost the same percentage of postpartum hemorrhage in smaller hospitals that had a lower number of deliveries compared to those hospitals with a higher number of deliveries.

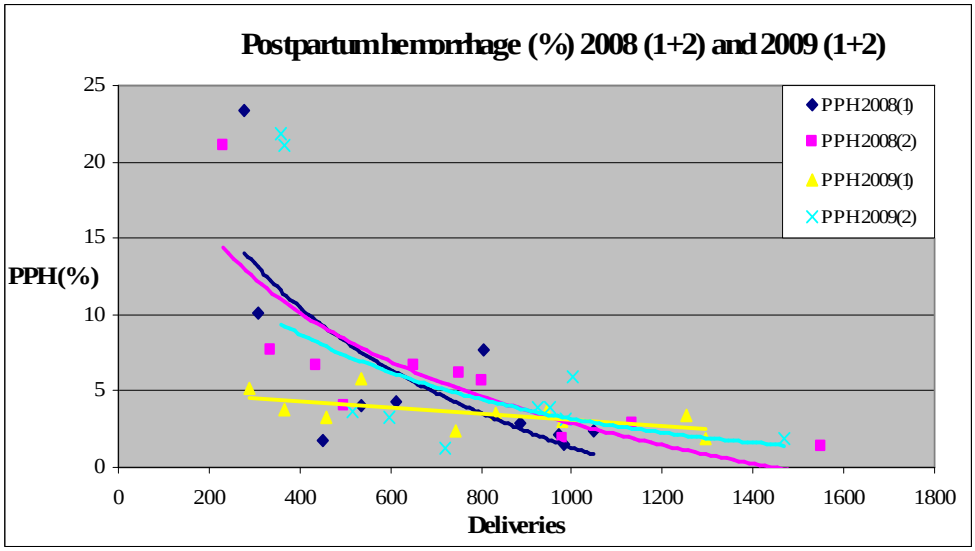


Figure 48:

Postpartum hemorrhage in relation to number of deliveries in four half-years in 2008 and 2009

Incidence of eclampsia with and without fits

A decreasing eclampsia rate in the ten hospitals in Kano and Kaduna State could not be observed. Within the two years of observation was even a small increase from 7.04% in first half-year 2008 to 9.83% in second half-year 2009. As shown in figure 49 there is a wide range of eclampsia rate between the hospitals with the smallest eclampsia rate between 0.7% and 3.4% in hospital 13 and the highest rate of eclampsia in hospital 25 with a rate between 19.44% and 50.86%. As shown in figure 45 only 2 hospitals registered a high rate of postpartum hemorrhage over 10%, the same hospitals also registered an eclampsia rate of more than 20% (hospital 24 and 25) within the observation time. In all hospitals there is still a need for improvement of the treatment of eclampsia.

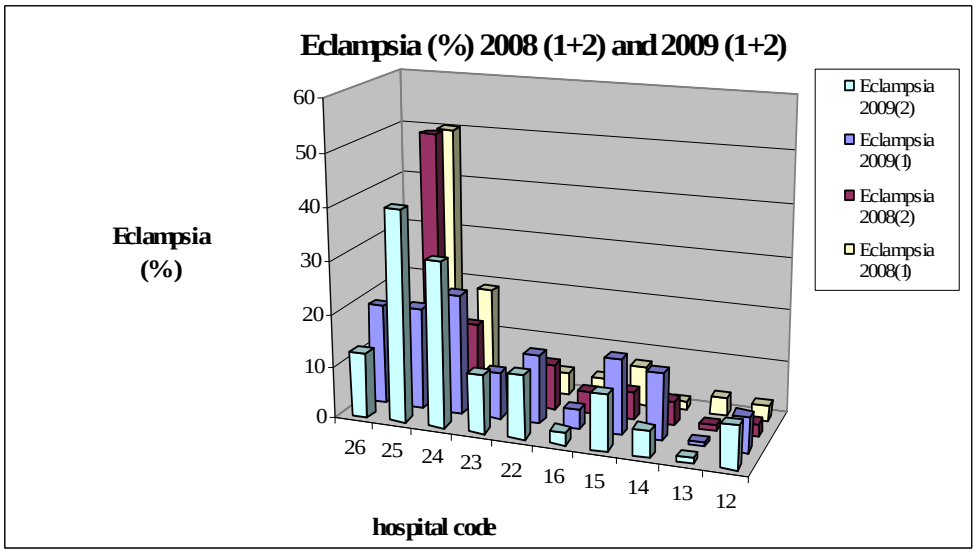


Figure 49:

Eclampsia in 10 hospitals in four half-years 2008 and 2009. A wide distribution of eclampsia rate is shown over ten hospitals.

Incidence of eclampsia in relation to the number of deliveries

Similar to MMR, FMR and PPH there is also a relationship between the rate of eclampsia and the number of deliveries in the respective hospital.

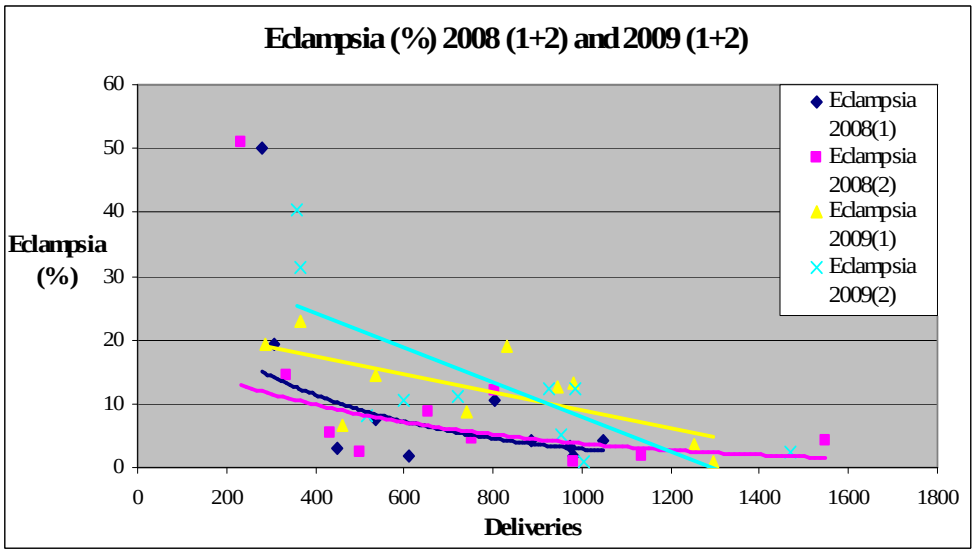


Figure 50:

Incidence of eclampsia in relation to the number of deliveries in four half-years 2008 and 2009.

High numbers of deliveries in a half-year period are associated with a lower rate of eclampsia. However, low numbers of deliveries show an increase of eclampsia in smaller hospitals.

5.2.4. Clinical profile 2009

The clinical profile is a method to benchmark the results of all the participating hospitals within one year.

The hospital with the lowest maternal mortality in 2009 was used as a reference hospital in the clinical profile. This hospital also has the lowest fetal mortality ratio (FMR), a low rate of eclamptic patients, a low incidence of postpartum hemorrhage (PPH) and a higher rate of Caesarean section (CS) [1].

From this comparison it is obvious to pinpoint the hospitals with the best results and that with a bad outcome.

	Median	**Range (min – max)**	**Reference Hospital**
Antenatal clinic visits (n)	4,284	(2,380 – 8,396)	2,901
Antenatal clinic visits follow up (n)	5,959	(3,645 – 17,106)	4,779
Number of deliveries (n)	1,641	(645 – 2,720)	2,298
Twin deliveries (%)	2.43	(1.54 – 3.59)	2.26
Breech deliveries (%)	2.48	(1.30 – 4.47)	2.79
Caesarean section (%)	4.51	(2.39 – 11.65)	6.74
Vacuum extraction (%)	0	(0 – 3.53)	0.48
Eclampsia (%)	11.17	(0.87 – 31.01)	0.87
Postpartum hemorrhage (%)	3.59	(1.84 – 14.42)	3.70
Maternal mortality (%)	**1.44**	**(0.35 – 2.59)**	**0.35**
Fetal mortality (%)	8.33	(5.18 – 17.72)	5.18

5.3. Discussion of the investigation and conclusions for further management

5.3.1. Selection of the hospitals

In July 2005 the project with the original title “Prevention and Treatment strategies of Obstetric Fistulae in Northern Nigeria” was established, supported by about 200 Rotary Clubs from several Districts of Germany and Austria. The major focus was firstly the education of the public about the harmful effects of early marriage and early pregnancy and secondly the creation of training centers for fistula surgery with the involvement of doctors and nurses to operate and take care of women, who suffer from obstetric fistulas.

Looking at the data of northern Nigerian hospitals it become apparent, that fistula surgery alone could not solve the problem of fistulas and maternal deaths, the problems which are closely connected. The decision was made to have an additional focus of obstetric services in a joint conference in December 2007 in Abuja with government officials. Therefore ten hospitals were selected, five in Kano State and five in Kaduna State, in order to create close partnership for improving the quality of obstetric care [2].

Following hospitals were selected:

Kano State: General Hospital Wudil, General Hospital Takai, General Hospital Sumaila, Sheik Jidda General Hospital Kano and General Hospital Gaya

Kaduna State: Yusuf Dantsoho Memorial Hospital Kaduna, General Hospital Saminaka, Hajiya Gambo Sawaba General Hospital Kofan Gaya, Zaria, General Hospital Kafanchan, and General Hospital Birnin Gwari

The ten selected hospitals are regularly provided with necessary equipments, e.g. delivery beds, instruments for carrying out Caesarean sections, sutures and curettages, vacuum extractors, fetal Doppler and mosquito nets.

Each hospital received a maternity record book for a regularly documentation of maternal and fetal deaths, type of delivery, e.g. breech delivery, vacuum extraction, Caesarean section, and complications such as eclampsia, postpartum hemorrhage and retained placenta after delivery. Data are collected monthly by a chief midwife of the Rotary Project and progress is monitored by heads of the gynecological departments of the University Teaching Hospital in Kano and Zaria [2].

5.3.2. Discussion of the results

Through the joints efforts by members of the Rotary Clubs in Germany and Austria, gynecologist and contributors of University Teaching Hospitals in Kano and Zaria and the Federal Government as well as the Ministry of Health of Kano and Kaduna State an improvement of quality assurance and a decreasing maternal mortality could be achieved.
Within an observation time of 2 years a reduction of almost 50% of the maternal mortality, from 1,790 maternal deaths per 100,000 deliveries in first half-year 2008 to 940 MD/100,000 deliveries in second half-year 2009, was recorded (figure 36 and 37). In first half-year 2010 a further reduction of maternal mortality to 790 MD/100,000 deliveries in all hospitals was documented. Both regions, Kaduna State and Kano State, recorded a decreasing maternal mortality in the observation time. Kaduna State recorded a nearly constant decrease of maternal mortality, whereas there were some variations of maternal mortality in Kano State (figure 38). Reasons for variations could not be identified and still need discussion, e.g. in following review meetings of all hospitals.

The results demonstrate that there is a relationship between the number of deliveries and the maternal mortality in the respective hospitals. Hospitals with lower numbers of deliveries within a half-year period recorded a higher percentage of maternal death (figure 39). Therefore the efforts should be focused on smaller hospitals with lower numbers of deliveries, mostly in rural areas. Quality assurance in obstetrics should not be a privilege of the urban hospitals with a high number of deliveries. Also small hospitals in rural areas should be able to improve the maternal health care for reducing maternal and fetal mortality.

Fetal mortality could not be reduced in the ten hospitals in northern Nigeria up to the present time. On average still fetal mortality is more than 8% in all hospital (figure 40). First and second delays are most likely still a reason for high fetal mortality. But as there is a strong relationship of FMR to maternal mortality (figure 41) the fall of maternal mortality will have an impact on the improvement of neonatal care in the hospitals and cause a decrease of fetal deaths.
The results show already an influence of intervention such as Caesarean section on fetal mortality. Paradoxically, a higher percentage of Caesarean section in a hospital results in a higher percentage of fetal death (figure 43), but in the second have-year 2008 the FMR remains constant at 10% following CS.

Similar to the maternal mortality there is also a close relationship between the fetal mortality rate and the number of deliveries in the respective hospital. Hospitals with a lower number of deliveries recorded a higher percentage of fetal death (figure 44). In developed countries the opportunity of transfer in tertiary hospitals of those women, where complications during labor are expected, is possible. In Nigeria, women often did not have one antenatal care when they reach the hospital in labor. Therefore there are limited information about pregnancy and the fetal status. In addition, the women often reach the hospitals in a late stage of labor. Transportation of patients to tertiary hospitals for a better treatment is often not possible, because there is a lack of time and transportation opportunities of the hospitals.

The incidence of postpartum hemorrhage in all hospitals averages 4.45% in 2008 and 4.16% in 2009 (figure 45). There was a close relationship between postpartum hemorrhage and maternal mortality (figure 46), which was more pronounced in 2008 than in 2009. A relationship of postpartum hemorrhage and the number of deliveries in the respective hospital could be found in 2008, but in 2009 such a relationship could not be detected in the same dimension (figure 48).

Eclampsia could not be reduced in the observation time of two years, there even was a little increase of eclamptic patients in all hospitals with 6.84% in 2008 and 9.98% in 2009 (figure 49). There was a wide spread distribution of eclampsia in the individual hospitals. A relationship of the incidence of eclampsia and the number of deliveries could be detected in both years (figure 50), with a higher rate of eclampsia in hospitals with a lower number of deliveries per year.

5.3.3. Conditions of the hospitals

The conditions and equipment status of the hospitals are closely connected to maternal and fetal death. An assessment of the hospitals equipment and hygienic conditions of the hospitals is conducted regularly with the objective of improvement of the conditions in all hospitals. As described in the Hospital Audit above, basic equipment is still incomplete in some hospitals or donated equipment is not used (e.g. ultrasound machines) for several reasons. Most of the selected hospitals still need a regularly improvement to reach a further reduction of maternal and fetal mortality. The chief midwife of the project, heads of the gynecology department of Kano and Rotarians from Germany and Austria frequently visit all hospitals to recognize shortage of equipment, hygienic conditions and manpower shortage in the selected hospitals.

5.3.4. Reliability of data collection

The introduction of a new system of quality assurance with a data collection started with a maternity record book including various quality indicators like maternal and fetal death, the type of delivery (e.g. breech delivery, vacuum delivery, Caesarean section) and complications during pregnancy and delivery (e.g. eclampsia, postpartum hemorrhage, retained placenta). The reliability of the data regarding the maternal mortality is checked by a maternal death form, which is handed out to the head of the gynecological department of the University Teaching Hospital Kano. An evidence for reliability is the relation of different parameters, which appear in all hospitals in a similar way, e.g. the relationship between maternal mortality and deliveries per half-year (figure 39). Two hospitals could be identified, which are deviating regarding the postpartum hemorrhage (figure 45 and 46) and the rate of eclampsia (figure 49 and 50) in both years. There must be a careful examination of the reliability of these data, as well as there also should be a careful view of all other data. In some hospitals more than one maternity records book could be found in the maternity unit, which can lead to wrong recording and incomplete information delivered to the chief midwife collecting the data monthly. There is still a need for a better documentation of obstetrical data of every woman delivering in the hospitals. The significance of data collection as part of the improvement of quality is an important point, which must be discussed with midwives at every visit and at review meetings. Problems of data collection should be pointed out and resolved at every visit of the hospitals.

5.4 References

[1] Maternal and Child Health Hospital – Report 2009, Kano State and Kaduna State (2009)

[2] Gruhl M., Künzel W., Zinser R.: Final Report MG 53403 2005-2010, Matching Grants, Report to the Rotary Foundation

6. General Discussion

6.1. Obstetric fistula as an indicator of an insufficient health care system

6.2. Ways to improve health care

6.3. References

6. General Discussion

6.1. Obstetric fistula as an indicator of an insufficient health care system

In developing countries such as Nigeria obstetric fistula and maternal mortality are closely connected. Reasons for maternal mortality and morbidity are well known and could be prevented in many cases with early treatment, which is limited for the reasons of the “three delays”: deciding to seek care, transport to the health facilities and insufficient care in the health facilities.

Many studies [1,2] emphasizes the thesis, that mainly poor, young, primapara, illiterate women with a short stature living in rural areas are most endangered of suffering from maternal morbidity such as fistulas or even dying during obstructed labor caused by these factors. Consequences of these factors can be a maternal death in some cases, but possibly lead also to maternal morbidity such as an obstetric fistula. If women survive the prolonged labor it will lead to the delivery of a mostly dead child. The development of obstetric fistula is an important component of maternal mortality and morbidity [3]; many women in developing countries are suffering from this disease and urgently need treatment of the obstetric fistula.

It is estimated that 358,000 women died during and following pregnancy and childbirth in 2008 [6], approximately another 2 million women are suffering from obstetric fistula worldwide [4], and both need attention and should be on focus in developing countries.

The improvement of maternal health care for prevention of maternal mortality in hospitals also takes advantage in preventing obstetric fistula caused by prolonged labor. Well equipped hospitals with skilled medical personnel and possibilities of intervention with surgical care reduce maternal mortality in cases of obstructed labor as well as the development of obstetric fistula and other maternal morbidities. Efforts in reducing the maternal mortality are also efforts in reducing obstructed labor and consequently reducing fistulas.

Besides efforts in quality assurance in obstetrics two million women worldwide, who already suffer from vesico-vaginal and recto-vaginal fistulas, need sufficient treatment of their morbidity. Therefore specialist fistula centers with experienced fistula surgeons, who are able to treat patients adequately, are urgently needed for the time the dilemma of obstetric fistulas exists. The aim of quality assurance in obstetrics in developing countries is reaching a health care standard for a sufficient treatment in cases of morbidities during pregnancy and labor and emergency cases. It would lead consequently to the extinction of obstetric fistulas in developing countries.

6.2. Ways to improve health care

Reasons and main strategies for reducing maternal mortality and morbidity are well known. They include antenatal care, labor and delivery management by qualified personnel and availability of emergency obstetric care [5]. Important for improvement of maternal health is the regularly view on health outcomes indicators, which are maternal and fetal mortality and morbidity. With a constant assessment of these indicators, analysis and discussion of the outcome by involving health care personnel, new strategies and standards can be created.

For reaching a sustainable development in maternal health multifaceted interventions are necessary. Important aspects are long-term investments and the involvement of government, district and community leaders of the villages and management of the single hospitals.

The project of Rotary International "Improvement of Maternal Health - Prevention and Treatment of Obstetric Fistulae" was first established in 2005 with the aim of improvement of maternal and fetal health in northern Nigeria. It was a project with multi-faceted interventions with the aim to reduce different delays which lead to maternal mortality.

Different *intervention regarding the "first delay"* are comprising education of the public by advocacy and awareness campaigns and political, traditional and religious leaders, people in villages and markets, universities and schools:

1. Launch of the radio serial "Ruwan Dare" ("Midnight Rain") [7] :

   The Population Media Center (PMC) established radio serials, which focuses on promoting reproductive health, enhancing knowledge, use of family planning services and prevention of HIV/AIDS. Reaching as many women and families as possible the actual serial "Ruwan Dare" is broadcast to four radio stations in Kaduna State, Katsina State, Sokoto State and Kano State in northern Nigeria. The aim is to increase the number of deliveries in health facilities, especially in emergency cases, and to advice treatment of pregnant women and those who suffer from maternal morbidities after deliveries such as fistulas.

2. "Community dialogues":

   In order to educate, inform and sensitize rural population for maternal and child mortality and morbidity "community dialogues" are carried out in communities surrounding the partnering health facilities. A chief midwife informs the population about topics of pregnancy and delivery including nutrition and antenatal care during pregnancy, immunization including polio, family planning and child spacing and the

possibility of seeking care for deliveries. Before visiting the villages, Village Heads get asked for permission to talk to women, men and young person in the community. Mosquito nets for protection against malaria and births kits for deliveries were handed out to the population.

3. Visiting of schools and villages:

   Project assistants and fieldworkers visited villages and secondary schools to provide comprehensive information about causes and treatment of VVF, preventing of VVF, morbidity and mortality after childbirth and other reproductive health related issues.

Regarding the "third delay" the attention is given to the health care facilities, including the topics of treatment of fistulas, equipment and hygienic conditions, improvement of management in health care facilities and data collection:

4. Treatment of fistula:

   Two centers for fistula repair and rehabilitation were created in Kano State and Kaduna State. Regular fistula repairs are carried out by specialized surgeons. Besides, training of fistula surgeons with the involvement of theatre nurses and ward nurses are conducted. In total, seven doctors and 15 ward nurses were trained by Dr. Waaldijk in surgery and treatment of obstetric fistula. Between October 2007 and July 2009 a total of 323 fistula treatments with 285 operations of fistulas were carried out (see Chapter 3)

5. Training of traditional birth attendants (TBAs):

   To improve quality of obstetric service in 2008 TBAs were trained in early recognition of risks during delivery, taking good records and using fetal Doppler to avoid intrauterine fetal deaths, to avoid "third delay", to apply magnesium sulfate for treatment of eclampsia and using anti-shock garment in case of post partum hemorrhage. Aim of the training was to increase the number of well attended deliveries.

6. Identification and providing necessary equipment in health care facilities:

   To enable the ten partnering hospitals to improve their obstetric services to prevent maternal and fetal mortality and morbidity necessary equipment of the facilities was identified and important equipment for obstetrical care was provided. Provided equipment included delivery beds, instruments to perform Cesarean sections and curettage, vacuum extractors, fetal Doppler and others. The status of health care

facilities and required equipment is examined in regularly visits of the partnering hospitals. In December 2009 the participating hospitals in Kano State and Kaduna State were visited and available and necessary equipment was checked; a detailed status of equipment of hygienic was observed. These data could be related to maternal mortality in the respective hospitals and a critical analysis whether the quality of care is carried out. This is checked by using the audits of health care facilities (see Chapter 4).

7. Institute of "Quality Assurance":

   An Institute of Quality Assurance was founded in 2008 in Aminu Kano Teaching Hospital (AKTH) in Kano State. Questionnaires with obstetrical data including maternal and fetal mortality and morbidity have been routinely collected by a chief midwife in the ten partnering hospitals. Data get collected, analyzed and discussed half-yearly, midwives and doctors of respective hospitals are participating in half-yearly "review meetings". Contents of meetings are the presentation and discussion of obstetrical data under the guidance of the Institute of Quality Assurance. Aims of "review meetings" are the regularly discussion of the results with realization of the deficiencies and creation and introduction of new standards to improve maternal health care. Additionally, education programs for doctors and nurses are conducted at the half-yearly "review meetings" e.g. how to use of anti-shock garments and the fetal Doppler.

The collaboration of the Federal and State Government, Ministry of Health, Management of Hospitals and District and Village Heads of the surrounding communities is necessary to scale up services for mothers and babies and reaching a sustainable improvement of health care facilities. A basic health care for the reduction of maternal mortality cannot be the task of development aid programs alone; for the establishment of a sufficient quality assurance in obstetrics the cooperation of the responsible government is an important factor.

Between Rotary International and the Ministries of Health in Kano State and Kaduna State there are regular contacts for a constant exchange of information and to focus the attention of local government on existing deficiencies in maternal health, especially in rural areas.

In this study an effective system for quality assurance in obstetric is presented. The main outcome indicator, which is the maternal mortality, could be reduced from 1790 MD per

100,000 deliveries in first half year 2008 to 790 MD per 100,000 deliveries in first half-year 2010, which is a decrease of maternal mortality of 55% in the participating health care facilities in northern Nigeria.

As shown in this study it is important to assemble the single intervention, which focused on different delays in maternal health, to reach a multifaceted system, which is able to scaling up maternal health care and reduce maternal mortality.

Prevention of “first delay” includes efforts in raising populations awareness of importance of maternal health care during pregnancy and delivery through the foundation of radio serials, community dialogues and keeping contact to traditional religious leaders, leaders of villages or districts, the government and, most important, to the people living in the villages.

Major effects could be achieved in the prevention of “third delay”, with the foundation of Fistula Centers in Kano State and Kaduna State, where many women already could be treated. Training of TBAs, nurses and doctors as well as equipment of health care facilities with instruments could improve maternal health. The foundation of an Institute of Quality Assurance (IQA) and analyzing and discussion of obstetrical data, which were collected in participating hospitals, gives the opportunity of measurement of effectiveness of intervention. It creates a spiral of improvement with analyzing and discussing of the deficiencies and creating and introducing new standards, which regularly have to be measured and analyzed again. With the foundation of the IQA in obstetrics the continuation and sustainable development of proceedings in ten partnering hospitals is guaranteed.

The continuous management and monitoring of all interventions and a regular feedback of all participating collaborators of the project is important to establish an effective system to fight against maternal deaths.

The establishment of a successful system, which gives the possibility of scaling up health care for mothers and children in northern Nigeria, can be a model of reducing maternal and fetal mortality also in other areas in Nigeria with insufficient health care.

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7. Summary

Introduction

All 192 United Nations Member States and Worlds Leading Development Institutions agreed to the eight MDGs in 2000: two of the Millennium Development Goals, MDG 4 and MDG 5, are aiming to reduce the under-five mortality ratio by two thirds and maternal mortality ratio by three quarters between 1990 and 2015. Nigeria has one of the worst records of maternal and child deaths in the world until present time. It is far away from these goals and reaching the MDGs 4 and 5 is still a big challenge.

The "three delays" as causes of high maternal mortality

Reasons and main strategies for reducing maternal mortality and morbidity are well known. They include antenatal care, labor and delivery management by qualified personnel and availability of emergency obstetric care. All these strategies are also reflected by the generally known three delays, which preclude pregnant women from receiving the right care in time. The *first delay* takes place in villages and is based on a socio-economic factor, consisting of insufficient knowledge of the dangerous signs before and during labor, the delayed decisions to bring the patients to a hospital and the insufficient power of decision making.

The *second delay* includes all problems of transportation of patients to the health facilities.

The *third delay* is caused by the insufficient system of hospital care in developing countries. The delay in receiving adequate and appropriate treatment at the facilities includes different factors such as shortage of supplies, equipment, drugs and blood products, trained personnel and competence of available personnel.

Obstetric fistula – a result of insufficient care during labor

The project of Rotary International "Improvement of Maternal Health - Prevention and Treatment of Obstetric Fistulae" was first established in 2005 with the aim of improvement of maternal and fetal health in northern Nigeria. The model for reduction of high maternal and child mortality and prevention and treatment of obstetric fistula in the north of Nigeria was focused by the Rotary International project mainly on *first and on third delay* of pregnant women seeking care with the aim to reduce maternal mortality by using a multifaceted system of interventions.

In order to create a consciousness of the population on existing problems of maternal and fetal morbidity and mortality Rotary International established different activities to inform the population on household, community and district levels about reasons and existing problems causing maternal and fetal mortality and morbidity with the aim of reducing *first delay*. An effective way of reaching women and their families, especially in rural areas of Nigeria, is the conduction of community dialogues. A Hausa speaking chief midwife carries out "community dialogues" in the villages in Kano State and Kaduna State in northern Nigeria within the catchment's area of the ten partnering hospitals to inform women, men and young person of the village communities, as well as traditional birth attendants (TBA's) about different topics of pregnancy, e.g. nutrition during pregnancy, importance of antenatal care and presence of medical personnel during labor and delivery.

The development of an obstetric fistula and the maternal mortality in the developing world are closely connected. Both are consequences of obstructed labor and insufficient care of women in prolonged deliveries and emergency cases during delivery.

Dr. Waaldijk, a consultant to the Federal Ministry of Health Nigeria, attends to the dilemma of obstetric fistulas in northern Nigeria and is carrying out operations and is training Nigerian doctors and ward nurses in treatment and caretaking of obstetric fistulas.

Between October 2007 and July 2009 a total number of 323 fistula patients were treated in Rotary Fistula Centre Wudil and in Rotary Fistula Centre Zaria, which were established by Rotary International in two hospitals in Kano State and Kaduna State in northwest of Nigeria. Documentation takes place of every surgery using patient's reports and treatment of vesico-vaginal and recto-vaginal fistula, which are carried out in one of the two fistula centers. A detailed characteristic of patient's details, i.e. age, residence, number of pregnancies, number of living children and height of women; and diagnosis with side, type and classification of fistula was assessed on the basis of these data. Distribution of age, residences and kind of operations as well as the success of operations could be demonstrated by correlating the data.

Hospital Audit – Infrastructure, Capacity and Necessary Improvement of Nigerian Hospitals in Kano State and Kaduna State

In 2008 an Institute of Quality Assurance was established at Aminu Kano Teaching Hospital in Kano State. Ten selected hospitals, five in Kano State and five in Kaduna State, participate in data collection and were introduced in quality assurance in obstetrics. Firstly, an evaluation of existing quality of structure, which includes equipments, personnel and facilities, was carried out. Deficiencies were detected in single hospitals and improvement of maternal health care could be reached by facilitating the hospitals with urgent needed equipment.

In December 2009 a detailed status of equipment of hygienic conditions of each room of the maternity units (operating theatre, delivery room, neonatal unit, obstetrical ward and general conditions) was assessed in the ten participating hospitals of the project. The collected data were related to the maternal mortality in the hospitals and a critical analysis whether the quality of care were carried out. Results show, that there is a relationship between the total conditions and the maternal mortality rate in hospitals; a low score of hygienic and equipment rating (=good conditions) were related to lower maternal mortality rate in respective hospitals. Besides, health care workers in hospitals were trained, e.g. in using fetal Doppler or anti-shock garment, for a better management of obstetric cases (quality of process). For measuring the quality of outcome in all hospitals data of obstetric care were regularly collected, half-yearly data were demonstrated and analyzed in “review meetings”. Under the guidance of the Institute of Quality Assurance these data can be discussed regularly with health workers of all participating hospitals. This gives a possibility of improvement in single hospitals by introducing new standards with the encouragement of all involved health workers in the hospitals.

Obstetrical management in Kano State and Kaduna State Hospitals in 2008 and 2009

The analyses of collected data in all participating hospitals demonstrate the achievement of reduction of maternal mortality and morbidity, which could be reached within five half-years. The main outcome indicator of quality assurance, i.e. maternal mortality, could be reduced from 1790 MD per 100,000 deliveries in first half-year 2008 to 790 MD per 100,000 deliveries first half-year 2010. This is a decrease of maternal mortality of more than 55% from January 2008 to June 2010 in participating health care facilities in northern Nigeria.

This study demonstrates with its results regarding maternal mortality an effective system for scaling up health care for mothers and children in northern Nigeria and can be used as a model to reduce maternal mortality also in other areas in Nigeria with insufficient health care systems.

8. Zusammenfassung

Einleitung

Die Mitglieder der „Organisation der Vereinten Nationen“ (UNO) und führende Institutionen für Entwicklungsarbeit einigten sich im Jahr 2000 auf acht Millennium-Entwicklungsziele (MDG): Zwei der acht Millennium Entwicklungsziele, MDG 4 und MDG 5, beabsichtigen die Kindersterblichkeit der unter fünfjährigen Kinder um zwei Drittel und die Müttersterblichkeit von 1990 bis 2015 um drei Viertel zu senken. Nigeria hat bis heute die höchste mütterliche und kindliche Sterblichkeit weltweit. Nigeria ist weit entfernt, diese Ziele zu erreichen. Daher sind vor allem die Millennium Entwicklungsziele 4 und 5 für Nigeria immer noch eine wichtige und zentrale Aufgabe. Die vorliegende Arbeit legt ein Modell vor, mit dem diese Ziele erreicht werden und auf andere Länder übertragen werden können.

Die “three delays” als Ursache für die hohe mütterliche Mortalität

Die Gründe und Strategien zur Senkung der mütterlichen Mortalität und Morbidität sind wohlbekannt. Sie beinhalten die unzureichende Schwangerenvorsorge, das insuffiziente Geburtsmanagement durch wenig qualifiziertes Personal und die Notwendigkeit, in der Geburtshilfe Kaiserschnitte und Notfallmanagement bei geburtshilflichen Komplikation zügig durchzuführen. Diese Strategien spiegeln sich auch in den allgemein bekannten „three delays“ wieder, welche schwangere Frauen daran hindern, die notwendige Betreuung rechtzeitig zu erhalten. Die erste Verzögerung („first delay“) ist begründet durch sozio-ökonomische Faktoren und findet bereits in den Dörfern statt. Sie kommt durch unzureichende Kenntnisse der Zeichen von geburtshilflichen Komplikationen vor und während der Geburt zustande, woraus die verspätete Entscheidung resultiert, die Patienten rechtzeitig in ein Krankenhaus zu bringen.

Die zweite Verzögerung („second delay“) beinhaltet alle Probleme des Transportes in die Krankenhäuser.

Die dritte Verzögerung („third delay“) besteht in der unzureichenden Versorgung der Kranken in den Hospitälern der Entwicklungsländer selbst. Die Verzögerung der notwendigen Behandlung in den Krankenhäusern beinhaltet verschiedene Faktoren, so z.B. das Fehlen von Material, unzureichende Ausstattung der Krankenhäuser, der Mangel an Medikamenten und Blutprodukten sowie unzureichend ausgebildetes Personal, welches häufig nicht die notwendigen Fähigkeiten zur Behandlung von Komplikationen während der Schwangerschaft und der Geburt besitzt.

Geburtsfisteln – ein Ergebnis von unzureichender Versorgung während der Geburt

Das Projekt von Rotary International, welches sich mit der Verbesserung der Müttergesundheit und der Prävention und Behandlung von Geburtsfisteln auseinandersetzt, wurde 2005 begonnen, um die mütterliche und kindliche Gesundheit in Nordnigeria zu verbessern. Das Modell zur Reduktion der hohen mütterlichen und kindlichen Mortalität und der Prävention und der Behandlung von Geburtsfisteln im Norden Nigerias konzentrierte sich vor allem auf die erste und dritte Verzögerung („first and third delay“) von schwangeren Frauen, die Hilfe benötigten. Ziel war es, durch ein vielschichtiges System von Interventionen die mütterliche Mortalität zu senken.

Um die Sensibilität der Bevölkerung für das Problem der hohen mütterlichen und kindlichen Mortalität und Morbidität zu erhöhen, begann Rotary International, die Öffentlichkeit in Haushalten und Gemeinden über die Ursache der mütterlichen und kindlichen Mortalität und Morbidität durch Radiosendungen und „community dialogues“ aufzuklären. Eine leitende Hebamme führte Gespräche mit Männern, Frauen und Jugendlichen in den Dörfern von Kano State und Kaduna State in Nordnigeria innerhalb des Einzugsgebietes der zehn teilnehmenden Krankenhäuser sowie auch mit traditionellen Geburtshelfern (TBAs = traditional birth attendants) über verschiedene Thematiken der Schwangerschaft, wie beispielsweise die Ernährung in der Schwangerschaft, Bedeutung von geburtshilflicher Vorsorge und die Anwesenheit von medizinischem Personal während der Wehen und der Geburt.

Die Entstehung von Fisteln, die durch Geburt bedingt sind, und die mütterliche Mortalität in Entwicklungsländern sind eng miteinander verbunden. Beide sind Folgen von verzögerten Geburten und unzureichender Versorgung der Frauen bei Notfallsituationen während der Geburt.

Dr. Waaldijk hat sich des Problems der durch Geburt bedingten Fisteln in Nordnigeria angenommen und führt Operationen bei Frauen mit dieser Erkrankung aus. Weiterhin bildet er nigerianische Ärzte und Krankenschwestern aus, damit diese die Behandlung und Versorgung von durch Geburt bedingten Fisteln angemessen durchführen können.

Von Oktober 2007 bis Juli 2009 wurden 323 Fistelpatientinnen im Rotary Fistula Centre Wudil und dem Rotary Fistula Centre Zaria, welche von Rotary International in zwei Krankenhäusern in Kano State und Kaduna State im Norden von Nigeria eingerichtet wurden, versorgt.

Jede chirurgische Intervention bei einer vesico-vaginalen und rekto-vaginalen Fistel in diesen beiden Krankenhäusern wurde in einem Operationsbericht dokumentiert. Angaben zu den Patientinnen, wie Alter, Herkunft, Anzahl der Schwangerschaften, Anzahl der lebenden Kinder und Größe der Patientinnen sowie die Diagnose mit Art und Klassifikation der Fisteln wurden dokumentiert und konnten so ausgewertet werden. Die persönlichen Angaben über Patientinnen sind nicht Gegenstand der Arbeit. Die Verteilung des Alters und der Herkunft der Patientinnen, Art der Operation sowie der Erfolg der Operationen konnten durch Korrelation der Daten dargestellt werden.

Hospital Audit – Ausstattung, Kapazitäten und notwendige Verbesserungen von nigerianischen Krankenhäusern in Kano State und Kaduna State

Im Jahr 2008 wurde das Institut für Qualitätssicherung in der Geburtshilfe im Aminu Kano Teaching Hospital in Kano State gegründet. Zehn Krankenhäuser, fünf in Kano State und fünf in Kaduna State, nahmen an der Datensammlung teil und wurden in die geburtshilfliche Qualitätssicherung eingeführt. Zunächst wurde eine Evaluation der Qualität der Struktur vorgenommen. Diese beinhaltete die Ausstattung und die personelle Struktur der Krankenhäuser. Bestehende Mängel der einzelnen Krankenhäuser wurden aufgezeigt. Eine Verbesserung der Müttergesundheit konnte durch eine Ausstattung der Krankenhäuser mit dringend benötigten Geräten und Instrumenten erreicht werden.

Im Dezember 2009 wurden detaillierte Daten in den zehn teilnehmenden Krankenhäusern erhoben. Diese beinhalten den Zustand der allgemeinen Equipment- und Hygienebedingungen sowie der Bedingungen in jedem Raum der Abteilung für Geburtshilfe: Operationssaal, Kreißsaal, Neugeborenen-Station und Geburtsstation. Die gesammelten Daten wurden in Beziehung gesetzt zu der mütterlichen Mortalitätsrate. Die Ergebnisse zeigen einen Zusammenhang zwischen den allgemeinen Bedingungen und der mütterlichen Mortalitätsrate in den Krankenhäusern; Krankenhäuser mit geringerer mütterlicher Mortalität weisen bessere Equipment- und Hygienebedingungen auf. Weiterhin wurden die Mitarbeiter der Krankenhäuser geschult, z.B. im Umgang mit dem fetalen Dopplergerät oder der pneumatischen Anti-Schock-Hose, um ein besseres Management von geburtshilflichen Komplikationen zu erreichen (Prozessqualität). Um die Ergebnisqualität zu messen, wurden Daten der Geburtshilfe von allen zehn teilnehmenden Krankenhäusern regelmäßig gesammelt und halbjährlich in sogenannten „review meetings“ dargelegt und analysiert. Unter der Aufsicht des Instituts für Qualitätssicherung wurden diese Daten regelmäßig mit den Mitarbeitern aller teilnehmenden Krankenhäuser diskutiert. Dies ermöglicht eine

Verbesserung durch die Einführung von neuen Qualitätsanforderungen mit der Unterstützung aller beteiligten Mitarbeiter der Geburtshilfe in den Krankenhäusern.

Geburtshilfliches Management in Krankenhäusern in Kano State und Kaduna State im Jahr 2008 and 2009

Die Analyse der gesammelten Daten der teilnehmenden Krankenhäuser zeigen im Ergebnis eine Senkung von mütterlicher Mortalität und Morbidität, welche innerhalb von fünf Halbjahren erreicht werden konnten. Der wichtigste Indikator des Erfolgs, die mütterliche Mortalität, konnte von 1790 mütterlichen Todesfällen (MD) pro 100.000 Geburten im ersten Halbjahr 2008 auf 790 mütterliche Todesfälle pro 100.000 Geburten im ersten Halbjahr 2010 gesenkt werden. Dies ist eine Abnahme der mütterlichen Mortalität von mehr als 55% von Januar 2008 bis Juni 2010 in den zehn teilnehmenden Krankenhäusern in Nordnigeria.

Diese Studie stellt mit ihren Ergebnissen bezüglich der mütterlichen Mortalität eine effektive Methode zur Verbesserung der gesundheitlichen Versorgung von Müttern und Kindern in Nordnigeria dar und kann auch in anderen Gebieten Nigerias in der Geburtshilfe als ein Modell zur Senkung der mütterlichen Mortalität dienen.

Figures and Graphs

All figures and graphs relate to tables compiled in Excel and are based on operation reports of Dr. Waaldijk (Chapter 3) and collected data of obstetrics of the participating hospitals (Chapter 4+5). Information material and tables are placed at your disposal at any time.

Public tertiary institutions offering obstetric services according to the six geopolitical zones in Nigeria:

ZONE – STATE - INSTITUTION

SOUTH WEST

Ekiti
- Federal Medical Centre, Ido-Ekiti Lagos
- Federal Medical Centre, Ebute Metta
- Lagos State University Teaching Hospital, Ikeja
- Lagos University Teaching Hospital, Idi-Araba

Osun
- Ladoke Akintola University Teaching Hospital, Osogbo
- Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife

Ondo
- Federal Medical Centre, Owo

Ogun
- Federal Medical Centre, Abeokuta
- Olabisi Onabanjo University Teaching Hospital, Sagamu

Oyo
- University College Hospital, Ibadan

SOUTH EAST

Abia
- Abia State University Teaching Hospital, Aba
- Federal Medical Centre, Umuahia

Anambra
- Nnamdi Azikiwe University Teaching Hospital, Nnewi

Ebonyi
- Ebonyi State University Teaching Hospital, Abakaliki
- Federal Medical Centre, Abakaliki

Enugu
- University of Nigeria Teaching Hospital, Enugu
- Enugu State University Teaching Hospital, Enugu

Imo
- Federal Medical Centre, Owerri
- Imo State University Teaching Hospital, Orlu

SOUTH-SOUTH

Akwa-Ibom
- University of Uyo Teaching Hospital, Uyo

Bayelsa
- Federal Medical Centre, Yenegoa

Cross-Rivers
- University of Calabar Teaching Hospital, Calabar

Delta
- Federal Medical Centre, Asaba
- Federal Medical Centre, Onicha-Olona
- Federal Medical Centre, Agbor
- Delta State University Teaching Hospital, Abraka

Edo
- University of Benin Teaching Hospital, Benin-city
- Irrua Specialist Teaching Hospital, Irrua

Rivers
- University of Port Harcourt Teaching Hospital, Port-Harcourt

NORTH -CENTRAL

Benue
- Federal Medical Centre, Markurdi

Abuja (Federal Capital Territory)
- National Hospital, Abuja
- University of Abuja Teaching Hospital, Gwagwalada

Kogi
- Federal Medical Centre, Lokoja

Kwara
- University of Ilorin Teaching Hospital, Ilorin

Niger
- Federal Medical Centre, Bida

Plateau
- Jos University Teaching Hospital, Jos

Bauchi
- Federal Medical Centre, Azare

NORTH-EAST

Borno
- University of Maiduguri Teaching Hospital, Maiduguri

Gombe
- Federal Medical Centre, Gombe

Yobe
- Federal Medical Centre, Nguru

Kaduna
- Ahmadu Bello University Teaching Hospital, Kaduna

Kano
- Aminu Kano Teaching Hospital, Kano

NORTH WEST

Katsina
- Federal Medical Centre, Katsina

Kebbi
- Federal Medical Centre, Birnin Kebbi

Sokoto
- Usmanu Danfodiyo University Teaching Hospital, Sokoto

Jigawa
- Federal Medical Centre, Birnin Kudu

Zamfara
- Federal Medical Centre, Zamfara
- Federal Medical Centre, Gusau

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Erklärung

Ich erkläre: Ich habe die vorgelegte Dissertation selbstständig, ohne unerlaubte fremde Hilfe und nur mit den Hilfen angefertigt, die ich in der Dissertation angegeben habe. Alle Textstellen, die wörtlich oder sinngemäß aus veröffentlichten oder nicht veröffentlichten Schriften entnommen sind, und alle Angaben, die auf mündlichen Auskünften beruhen, sind als solche kenntlich gemacht. Bei den von mir durchgeführten und in der Dissertation erwähnten Untersuchungen habe ich die Grundsätze guter wissenschaftlicher Praxis, wie sie in der „Satzung der Justus-Liebig-Universität Gießen zur Sicherung guter wissenschaftlicher Praxis“ niedergelegt sind, eingehalten.

_____

Gießen, 08.08.2011 Stefanie Adams

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